Hatfield has twice, taught the NIOSH Course NO. 582 "Sampling and Evaluating Airborne Asbestos Dust" for the University of Alabama in Birmingham, and was appointed as an expert advisor to EPA's negotiated rule-making committee to promulgate new regulations for asbestos in schools. These regulations are known as the Asbestos Hazard Emergency Response Act (AHERA) regulations. Additionally Mr. Hatfield has participated in the US EPA's Peer Review of research projects.

RICHARD L. HATFIELD

Corporate Consultant / Principal

List of Depositions/Trial Testimony

1991

Chen Northern; Salt Lake City, Utah - Deposition
Chromalloy Clayton Center - Deposition
City of Baltimore - Deposition
City of Wichita - Deposition
Cullen Center; Houston, Texas - Deposition
IDS; Minneapolis, Minnesota - Deposition
Kansas City International; Kansas City - Trial Testimony
National Schools Class Action - Deposition
Northglenn Mall; Denver, Colorado - Trial Testimony
South Carolina Consolidated Schools - Deposition
University of Vermont - Deposition

1992

7th Day Advent - Deposition
Archdiocese of St. Louis - Deposition
Armstrong - Deposition
Bunker Hill - Deposition
Bunker Hill - Trial Testimony
Commerce Center - Trial Testimony
Cullen Center - Deposition
Cullen Center - Trial Testimony
Dayton - Deposition
Farm Credit - Deposition
Jackson Laurel - Deposition
Metro Atlanta - Deposition
Prudential - Deposition
State Farm - Deposition
Trizec - Deposition
Wichita - Deposition

1993

7th Day Adventist, Trial Testimony
Barnes Hospital, Deposition
CalFed, Deposition
Celotex, Deposition
Celotex, Trial Testimony
City of Baltimore, Trial Testimony
Commonwealth of Massachusetts, Deposition
Clearwater, Deposition
Ecolab, Deposition
Fargo Clinic, Deposition
Michigan Class Action, Deposition
Northstar, Trial Testimony
Northern States Power (NSP), Deposition
State Farm, Trial Testimony

1994

1880 Century Park, Deposition
1880 Century Park, Trial Testimony
BellSouth, Deposition
Chittenden Trust, Deposition
Dallas Space Center, Deposition
Exchange Park Mall, Trial Testimony
Marine City Tower, Deposition
Marina City Tower, Trial Testimony
Mt. Lebanon, Deposition
One Wilshire, Deposition
Paramount, Deposition
Sioux Valley, Deposition
Sioux Falls, Trial Testimony
Commonwealth of Massachusetts, Trial Testimony

1995

Banc One Building; Milwaukee, Deposition
Chicago City Schools, Deposition
Piedmont Center, Deposition
Irvine Corporation, Deposition
IDS Tower, Trial Testimony
Hines, Deposition
Connecticut Mutual, Deposition
NBD, Deposition
Commonwealth of Kentucky, Deposition

425 California Building, Deposition
Fox Plaza, Deposition
Sentinel Management, Deposition

<u>1996</u>
State of North Dakota, Deposition
1st National Bank Center, East Blvd.; Oklahoma, Deposition

updated: 06/11/96

rlh-96.sam

Hatfield, R.L.

LIST OF DOCUMENTS / EXHIBITS

The following is a listing of the principal materials upon which I will use as a basis for my opinions and may use these materials as exhibits at trial. I may rely in whole or in part on the following documents and items, as well as the opinions, data, and publications contained in other plaintiffs expert reports. I may also comment on the reports, data or testing done by defendant's expert.

1 Richard R. Hatfield Curriculum Vitae

2 Hatfield, R.L., "Settled Dust Sampling and Analysis, Determining Levels of Asbestos Contamination" 1994

3 Millette, J.R., W.M. Ewing and R.S. Brown, 'Stepping on Asbestos Debris." Microscope, vol. 38, 1990 pp 321-326.

4 Millette, J.R., W.M. Ewing and R.S. Brown, "A Close Examination of Asbestos-Containing Debris", NAC Journal Fall 1990, pp. 38-40.

5 Keyes, D.L., Ewing, W.M. et al., "Baseline Studies of Asbestos Exposure During Operations and Maintenance Activities" Appl. Occup. Environmental Hygiene, vol 19, no 11 (1994)

6 Keys, D.L., Chesson, J., et al. "Reentrainment of Asbestos from Dust in Building with Acoustical Plaster" Environmental Choices Technical Supplement, vol. 1, no 1 (1992)

7 Ewing, W.M., Chesson, J., et al. "Asbestos Exposure During and Following Cable Installation in the Vicinity of Fireproofing" Environmental Choices Technical Supplement vol. 2, no 1 (1992).

8 Keys, D.L., Chesson, J., et al. "Exposure to Airborne Asbestos Associated with Simulated Cable Installation Above a Suspended Ceiling" Am J Ind. Hyg. J 1991; 52 (ii): 479-484

9 ASTM Method D-5755 (1995)

10 GSA Asbestos Abatement Guide Specification 02085 (July 1993)

Hatfield, R.L.

11 Memo from J.C. Yang to B.J. Bettachi (June 4, 1986)

12 Letter from Michael E. Beard to Vickie H. Ainslie (August 20, 1991)

13 MAS analysis on dust sample from 888 project (Sept. 8, 1992)

14 MAS analysis on dust samples from First Union Bank Building (Oct. 14,1992)

15 MAS analysis on dust samples from Multi-Foods, Town of City Center (July 13, 1992)

16 MAS analysis on dust sample from Galtier Plaza (April 6,1992)

17 MAS analysis on dust samples from Multi-Foods, Town of City Center (July 13, 1992)

18 MAS analysis on dust samples from Clayton Executive Center II (Feb. 10, 1992)

19 MAS analysis on dust samples from 130 John Street, Project M1839

20 MAS analysis on dust samples from 130 John Street, Project M13586

21 MAS product identification analysis for bulk samples from 130 John Street (June 28,1990)

22 MAS product identification analysis for bulks samples from 130 John Street (March 22, 1991)

23 MAS analysis for dust samples from Hunt Valley Marriott Hotel, Project M2074

24 MAS Product identification analysis for bulk samples from Hunt Valley Marriott (July 13, 1990)

25 MAS product identification analysis for bulk samples from Hunt Valley Marriott (July 17, 1990)

Hatfield, R.L.

26 MAS analysis on dust samples from the Renaissance Tower, project M2246

27 MAS product identification analysis for bulk samples from Renaissance Tower (June 25, 1990)

28 MAS product identification analysis for bulk samples from Renaissance Tower (March 26, 1991)

29 MAS analysis on dust samples from the Prudential Plaza Newark Building, project M1526

30 MAS analysis on dust samples from the Prudential Plaza Newark Building, project M13584

31 MAS product identification analysis for bulk samples from the Prudential Plaza-Newark building (July 13, 1990)

32 MAS product identification analysis for bulk samples from the Prudential Plaza Newark building (July 13, 1990) (M1631)

33 MAS analysis on dust samples from the 5-Penn Center, project M1527

34 MAS analysis on dust samples from the 5-Penn Center, project M13585

35 MAS product identification analysis for bulk samples from the 5-Penn Center, (August 6, 1990)

36 MAS analysis on dust samples from the Embarcadero Center 1, project M1869

37 MAS analysis on dust samples from the Embarcadero Center 1, project M13471

38 MAS product identification analysis for bulk samples from the Embarcadero Center 21, (June 25,1990)

39 MAS analysis on dust samples from the Embarcadero Center 2, project M1304

Hatfield, R.L.

40 MAS analysis on dust samples from the Embarcadero Center 2 building, project M13250

41 MAS analysis on dust samples from the Embarcadero Center 2, project M13470

42 MAS product identification analysis for bulk samples from the Embarcadero Center 2 (June 25, 1990)

43 MAS analysis on dust samples from the Century Center buildings 2200 and 2600 project M2140

44 MAS product identification analysis for bulk samples from the Century Center 2200 building (June 27, 1990)

45 MAS product identification analysis for bulk sample from Century Center 2600 building (June 27, 1990)

46 MAS analysis on dust samples from the First Florida Tower project M1811

47 MAS analysis on dust samples from the First Florida Tower project M

48 MAS project identification analysis for bulk sample from the First Florida Tower (June 25, 1990)

49 MAS project identification analysis for bulk samples from the First Florida Tower (March 22, 1991)

50 MAS analysis on dust samples from the 1100 Milam building, project M2252

51 MAS product identification analysis for bulk samples from the 1100 Milam building (June 25, 1990)

52 MAS product identification analysis for bulk samples from the 1100 Milam building (March 26 1991)

53 MAS analysis on dust samples from the Northland Towers, project M1524

Hatfield, R.L.

54 MAS analysis on dust samples from Northland Towers, project M15197

55 MAS product identification analysis for bulk samples from Northland Towers (July 12, 1990)

56 MAS product identification analysis for bulk samples from Northland Towers (March 27, 1991) Two reports

57 MAS analysis on dust samples from Northwest Financial Center, project M1892

58 MAS product identification analysis for bulk samples from the Northwest Financial Center (June 25, 1990)

59 MAS analysis on dust samples from the Southdale Office Complex, project M3038

60 MAS product identification analysis for bulk samples from the Southdale Office Complex (March 25, 1991)

61 MAS analysis on dust samples from the Twin Towers (Atlanta Gas Light) project M13887

62 MAS product identification analysis for bulk samples from the Twin Tower building (South) June 25, 1990 and March 22, 1991

63 MAS product identification analysis for bulk samples from the Twin Tower building (Gas Light) June 25, 1990 and March 22, 1991.

64 MAS analysis on dust samples from the Prudential Plaza - Denver project M1161

65 MAS product identification analysis for bulk samples from Prudential Plaza - Denver July 12, 1990 and March 22, 1991

66 MAS analysis or dust samples from Chatham Center, project M1303

67 MAS product identification analysis for bulk samples from Chatham Center (August 6, 1990)

Hatfield, R.L.

68 MAS analysis on dust samples collected by Compass Environmental, project M13908

69 MAS analysis of dust samples from Prudential Plaza building, project M13678

70 MAS analysis of dust samples from 5-Penn Center, project M13677

71 MAS analysis of dust samples from Embarcadero Center 1 building, project M13748

72 Dust Sample Evaluation Chart with Attachments

73 Ewing, W.M., Dawson, T.A., et al. "Observations of Settled Asbestos Dust in Buildings", EIA Technical Journal, Summer 1996

74 Letter to Mr. Henry J. Singer of the General Services Administration from Mr. William G. Rosenberg of the EPA dated December 29, 1992

75 Millette, J.R. and Hayes, S.M., Settled Asbestos Dust: Sampling and Analysis, CRC Press Boca Raton, 1994

76 Park, N.W., Walcot, R.J. and Brogan, P.S., "Worker Exposure to Asbestos During Removal of Sprayed Material and Renovation Activity in Buildings Containing Sprayed Material" American Industrial Hygiene Journal, vol. 44, no 6 (1983), pp 428-432

77 Crankshaw, O.S., Perkins, R.L. and Beard, M.E., "An Evaluation of Sampling, Sample Preparation, and Analysis Techniques for Asbestos in Settled Dust in Commercial and Residential Environments" EIA Technical Journal, Winter 1995, pp 10-14

78 Wilmoth, R.C., Powers, J.T., and Millette, J.R., "Observations on Studies Useful to Asbestos O&M Activities" Microscopy vol. 39, 1991 pps. 229-312

79 Crankshaw, Owen S., Research Triangle Institute "Quantitative Evaluation of Relative Effectiveness of Various Methods for the Analysis of Asbestos in Settled Dust" (1995)

Hatfield, R.L.

80 Report under EPA contract 68-03-4006 "Asbestos Fiber Reentrainment During Dry Vacuuming and Wet Cleaning of Asbestos Contaminated Carpet."

81 Comparison of Ariborne Asbestos Levels Determined by Transmission Electron Microscopy (TEM) Using Direct and Indirect Transfer Techniques EPA 560/5-89-004, March 1990

82 W.R. Grace laboratory Reports Index (04/06/61-07/23/64)

83 Markowitz, S.B., et al. "Asbestos Exposure and Fire Fighting" Annals New York Academy of Science, pp. 573-577

84 March 10, 1987, letter from William Cooley to Michael Tucker

85 June 15, 1983 memo from W.R. Wright to T.E. Winkel

86 November 6, 1986 memo from Julie C. Yang to D. Wightman

87 August 13, 1970 memo from R.E. Schneider to H.A. Brown

88 August 7, 1970 memo from H.L. Waxman to H.A. Brown

89 Three Video Tapes of the Friability and Ceiling Tile Lifting Demonstration from the Prudential Plaza Newark, 5-Penn Center and Embarcadero Center One Building taken by Richard Hatfield

Additionally, I may rely on various photographs and/or video tapes taken by Richard L. Hatfield, Law personnel or other consultants during the inspections of these buildings and reports or notes written during or following the building inspections.

Hatfield, R. L.

Compensation

Law Engineering and Environmental Services Inc., will be compensated for my time spent working on this project. The rates Law will invoice of my services are as follows:

Consulting.. $ 150.00 per hour

Deposition and Trial Testimony.. $ 225.00 per hour

Associated expenses incurred are invoiced at actual cost.

PRUDENTIAL BUILDINGS: REPORT OF WILLIAM M. EWING, CIH

Prepared by:

William M. Ewing, CIH
Technical Director
Compass Environmental, Inc.
Robinson Road, Suite B
Marietta, Georgia 30068

July 30, 1996

PRUDENTIAL BUILDINGS: REPORT OF WILLIAM M. EWING, CIH

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PRUDENTIAL BUILDINGS: REPORT OF

WILLIAM M. EWING, CIH

I. INTRODUCTION AND BACKGROUND

William M. Ewing, CIH of Compass Environmental Inc., 2231 Robinson Road, Suite B, Marietta, Georgia 30068, was requested to evaluate selected buildings previously or currently owned by Prudential. Mr. Ewing is an expert on asbestos in buildings issues. Mr. Ewing is qualified as an expert in this area as a result of his education and experience in the field of asbestos identification, evaluation and control.

Mr. Ewing received a Bachelor of Sciences in Biology from Washington and Lee University. In 1978, Mr. Ewing worked at Clayton Environmental Consultants, Inc. as an industrial hygienist. In 1981, he joined the Georgia Tech Research Institute and started their industrial hygiene laboratory, instituted the hazardous waste program for small business in Georgia, was director of the EPA-sponsored Asbestos Information Center, and served as an industrial hygienist under the 7 (c) (1) program, sponsored by OSHA. In 1983, Mr. Ewing became board certified in the comprehensive practice of industrial hygiene. He was re-certified in 1989 and 1995 in accordance with the American Board of Industrial Hygiene requirements. In 1995 he was nominated by his peers and appeared as an American Industrial Hygiene Association Fellow Member. In 1987, he left the Georgia Tech Research Institute to take the position of Executive Vice President at The Environmental Management Group, Inc. In 1990, Diagnostic Engineering, Inc. acquired

The Environmental Management Group, Inc. and employed Mr. Ewing as Regional Technical Director until 1993 when he formed the consulting firm, Compass Environmental, Inc., where he is currently the Technical Director.

During his career, Mr. Ewing has conducted numerous industrial hygiene, asbestos management and environmental studies. He has authored several publications and served on many committees, including governmental and industrial committees, to study the following: identifying asbestos in buildings, disposal of asbestos-containing materials, and removal of asbestos-containing materials in buildings. Mr. Ewing has provided asbestos-related consulting services to property managers and building owners throughout the United States and Canada. He has conducted over 1,000 asbestos surveys for asbestos-containing material (ACM). He has developed asbestos management and control programs in commercial and government facilities; including commercial office buildings, schools, hospitals, ships, industrial plants and government buildings. In addition, Mr. Ewing has frequently directed or lectured in training courses sponsored by universities, government agencies and private interests on topics including industrial hygiene, respiratory protection, and asbestos identification, evaluation, and control.

As a result of Mr. Ewing's work experience and asbestos training, he is qualified to offer opinions related to asbestos in buildings including the following: the condition of the in-place asbestos-containing materials; air, dust, and bulk sampling techniques; regulations and guidance documents applicable to asbestos in buildings; the reasonableness of the

precautions taken by building owners and managers for maintaining in-place asbestos-containing materials; the contamination in a building resulting from the in-place asbestos-containing materials; options available to building owners and managers when dealing with asbestos; the necessity to remove the in-place asbestos-containing materials during a renovation; and the ultimate need to remove the asbestos-containing materials upon demolition of the building. Mr. Ewing's expert qualifications and training are set forth more fully in his Curriculum Vitae in Appendix A.

Mr. Ewing has testified as an expert on asbestos-in-building issues on several occasions in both federal and state court. Included in Appendix B is a list of Mr. Ewing's asbestos expert deposition and trial testimony over the last five years. Compass Environmental, Inc. has and will be compensated for Mr. Ewing's time at a rate of $145/hour. Compensation for Mr. Dawson's time is at a rate of $95/hour.

The purpose of the Prudential buildings evaluation was to review actions taken to date by the building owner, conduct inspections of remaining fireproofing in the buildings, determine the current condition of the remaining asbestos-containing fireproofing, conduct sampling as appropriate, and opine on the reasonableness of the asbestos program implemented by the building owner.

This report summarizes these findings and includes a description of methods employed, a discussion of the findings, and conclusions drawn based on these findings. Included as

Appendices to this report are photographs and laboratory results of sampling conducted. In addition to the references cited herein, Mr. Ewing may rely on the opinions, data and publications contained in plaintiffs' other expert reports.

II. PROCEDURES AND METHODS

The buildings included for consideration are listed in Table 1. For all buildings, documents related to asbestos-containing materials were reviewed. Site visits were made to all buildings except the Short Hills Office Complex in Short Hills, New Jersey. The Short Hills Office Complex in Short Hills was completely abated prior to demolition in 1984.[1-4]

Table I. Selected Prudential Buildings

Building Name	Location
Embarcadero I	San Francisco, CA
Embarcadero II	San Francisco, CA
Chatham Center/Hyatt	Pittsburgh, PA
130 John Street	New York, NY
Hunt Valley Marriott	Hunt Valley, MD
5 Penn Center	Philadelphia, PA
Prudential Plaza	Newark, NJ
Brookhollow I	Houston, TX

Short Hills Office Complex	Short Hills, NJ
Renaissance Tower	Dallas, TX
Northland Towers	Southfield, MI
First Florida Tower	Tampa, FL
Northwest Financial Center	Bloomington, MN
1100 Milam	Houston, TX
Prudential Plaza	Denver, CO
Southdale Office Complex	Edina, MN
Century Center I & IV	Atlanta, GA
Twin Towers	Atlanta, GA

For each building various asbestos-related documents were reviewed, often including the asbestos survey, operations and maintenance program and floor plans. These documents were reviewed to gain an understanding of the building lay-out, use, occupancy, and the types of asbestos-containing materials known to be present, and their locations. Arrangements for the building visits were made with each building representative. This was often the building manager or building maintenance director. Assistance was usually provided by building maintenance staff, local asbestos consultants, and/or local asbestos abatement contractors, as necessary.

The results of asbestos surface dust sampling for each building visited were reviewed. These samples were collected by Law Associates, Inc. and analyzed by Materials

Analytical Services, Inc. (MAS). All of these samples were collected in 1988 - 1995. The results of bulk sample analyses were also reviewed with William E. Longo, Ph.D. of MAS. For these buildings the focus was the spray-applied asbestos-containing fireproofing.

At each building a visual inspection of the remaining fireproofing was conducted to determine its current condition and accessibility. The assessment techniques employed were as described in the Asbestos Hazard Emergency Response Act (AHERA) regulations promulgated by the US Environmental Protection Agency (EPA).[5-7] The Asbestos School Hazard Abatement Reauthorization Act (ASHARA) extended certain provisions of the AHERA regulation to public and commercial buildings.[8] One significant provision was the requirement that only accredited inspectors perform building inspections.[9] The assessment procedures used by accredited inspectors is that prescribed by AHERA.

The AHERA assessment procedures place each friable asbestos-containing material into an assessment category based on its degree of damage. For a surfacing material such as friable fireproofing the available categories include:

1. Significantly damaged friable surfacing ACBM (asbestos-containing building material) - a material exhibiting greater than 10% damage evenly distributed or 25% damage in a localized area.

2. Damaged friable surfacing ACBM - a material exhibiting greater than 1 - 2% damage and less than 10% damage evenly distributed or 1 - 2% damage and less than 25% damage in a localized area.

3. Friable surfacing ACBM with a potential for significant damage - a material that is not damaged or significantly damaged but has the potential for damage that would be both extensive and severe.

4. Friable surfacing ACBM with a potential for damage - a material that is not damaged or significantly damaged but has the potential for damage to occur.

5. Other friable ACBM - a surfacing material that does not fall into one of the four previous categories.

Damage of a surfacing material is evidenced by the presence of physical damage such as gouges, blistering, and vandalism; water damage indicated by stains, flaking, or delamination; and damage due to deterioration or vibration. Damage due to deterioration or vibration is visually assessed by the presence of ACBM debris (having the same color and texture) on surfaces beneath the ACBM.

In addition to the visual assessment, surface dust sampling was also conducted in six buildings. Small particles, generally less than 1 millimeter (mm) in diameter, cannot

usually be identified as ACBM based on color and texture. Dust sampling with analysis by transmission electron microscopy (TEM) allows for a quantitative estimate of asbestos structures on surfaces. Since dust sampling had been conducted previously in most of these buildings, the primary purpose was to augment the previous sampling and conduct side-by-side measurements to compare results using the 1988 methodology with the 1995 ASTM method D 5755-95.

In each of five Prudential buildings, three locations were randomly selected. Each location was a horizontal non-porous surface beneath asbestos-containing fireproofing. All locations had a visually discernible layer of dust. No particles greater than 1 mm in diameter were on the surfaces sampled. At each location, two samples were collected side-by-side. One of these samples was collected using the 1988 methodology and one collected as described in the current ASTM method.

The sampling conducted in 1988 - 1989 by Law Associates used a 37 mm diameter cassette attached to a pump calibrated at 2 liters per minute (l/min). These samples were collected from a measured surface area, usually one square foot. The 1988 - 1989 sampling used a 0.8 μm pore size mixed cellulose ester (MCE) filter and collected the sample open face.

The ASTM standard method in 1995 allows for a 25 mm cassette, any pore size equal to or less than 0.8 μm, an MCE filter, and a standard collection area of 100 cm^2 (although

smaller or larger areas are allowed). The significant difference is the addition of a sample collection nozzle providing a standard flowrate at the surface of approximately 100 centimeters per second (cm/sec). This value is considerably higher than the 6.4 cm/sec velocity when an open face 37 mm cassette is used (33 mm effective area). A copy of the ASTM method is included at Appendix C.

All dust samples were submitted to MAS for analyses. It was requested the laboratory follow the same procedures followed in 1988 for the 37 mm cassettes and the ASTM standard method for the 25 mm cassettes. Eight field blank (control) samples were also submitted as a check for systematic contamination in the field or laboratory. Results were reported as asbestos structures per square centimeter (s/cm^2) and asbestos structures per square foot (s/ft^2).

Following the building visits, additional documents related to the asbestos in the Prudential buildings were reviewed. These consisted of additional building surveys, asbestos management procedures, abatement records, air monitoring reports, laboratory reports, and other miscellaneous records. In addition, documents and deposition transcripts of defendants' representatives were reviewed. Principal documents relied upon appear in the reference list at the conclusion of this report.

III. PRESENTATION AND DISCUSSION OF FINDINGS

Findings are discussed below by building followed by a general discussion of topics that apply to multiple buildings.

H. BROOKHOLLOW I BUILDING, HOUSTON, TX

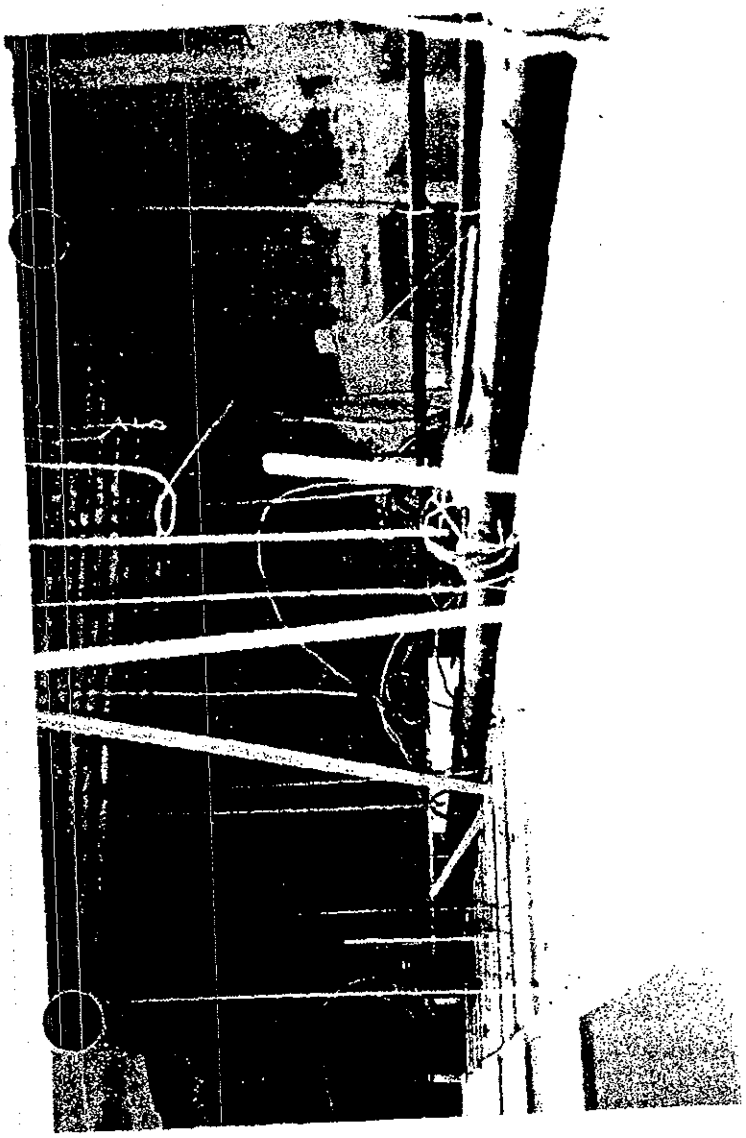
The Brookhollow I building is a 12-story office building located in Houston, TX. The building was reported to have approximately 175,000 ft^2 of friable fireproofing applied to all the structural steel of the building.[33] The fireproofing was reported to have been completely removed. The reason for the removal and replacement of the fireproofing was reported by Mr. O. Dean Holcomb (Property Manager) was to facilitate complete renovation of the space for the new tenant (Harris County Appraisal District).

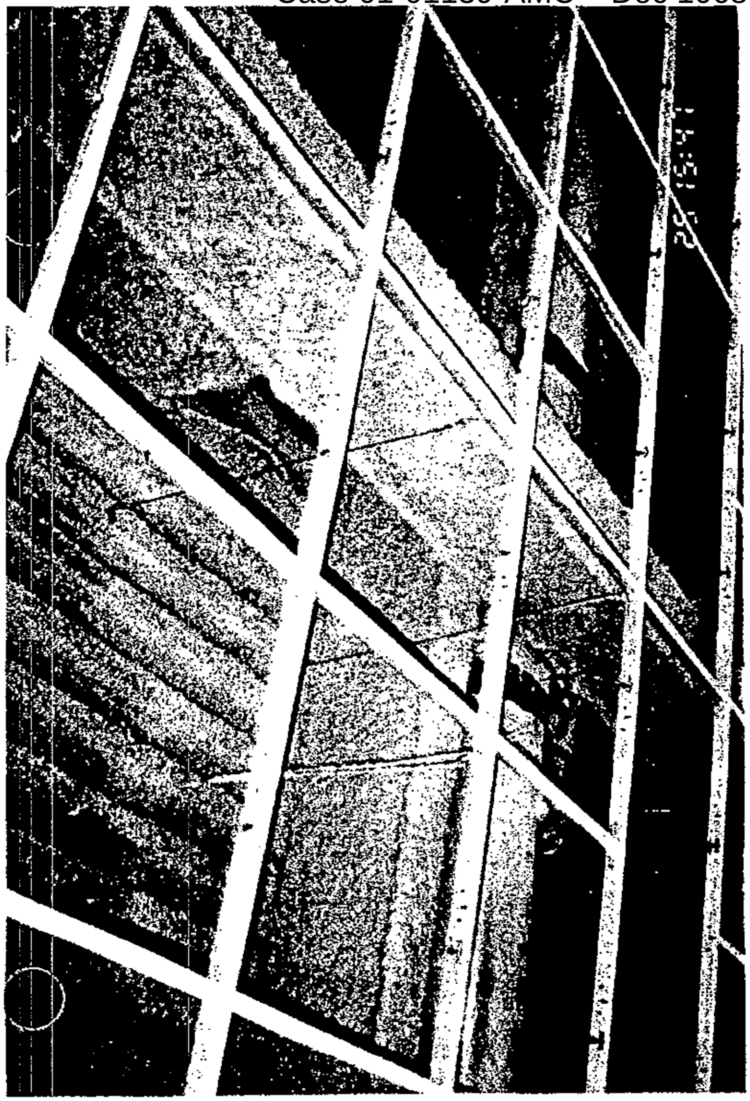
William M. Ewing, CIH and Tod A. Dawson of Compass visited the building on April 25, 1996. It was visually apparent that the original fireproofing had been applied to structural members of the building with moderate overspray on the corrugated steel deck. It was also apparent that small quantities of original fireproofing remained at locations difficult to access, such as the attachment point for hanger straps. (See photograph 25 15:44).

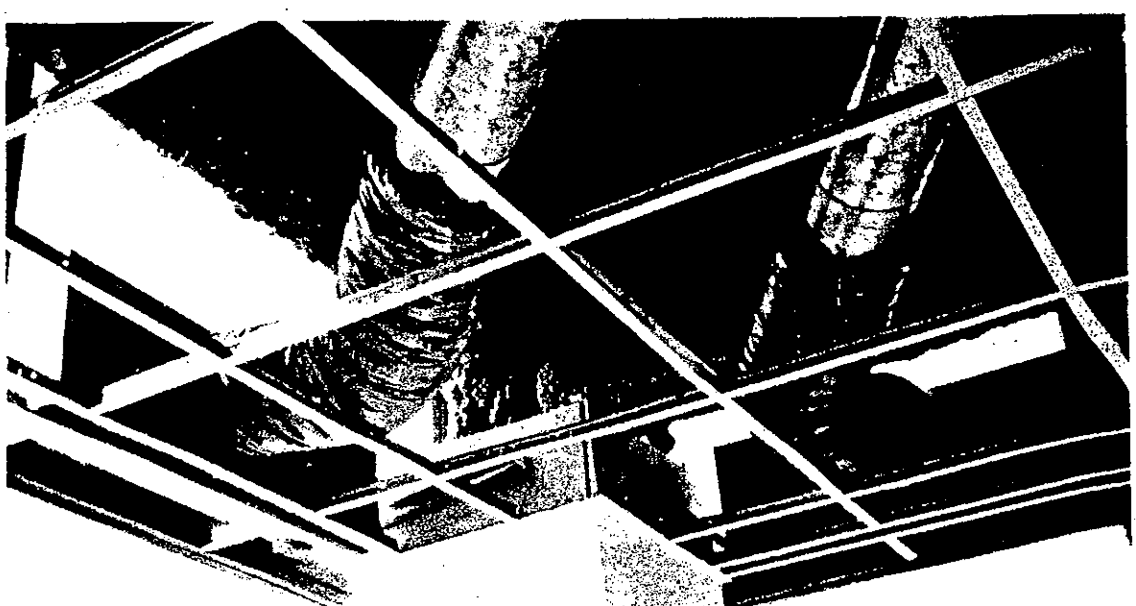
The original fireproofing was reported to be Monokote MK-3.[12] No surface dust sampling was conducted at this location and no air sampling data for maintenance or renovation activities were located.

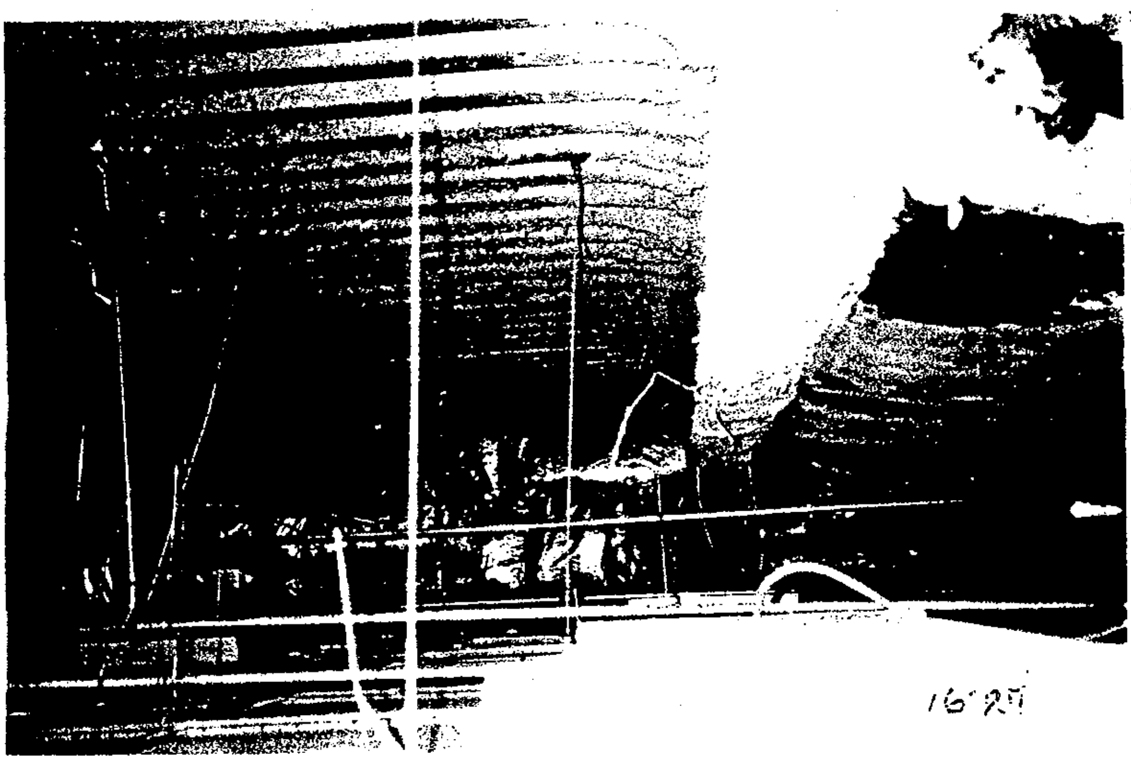
PRUDENTIAL INSURANCE CO.
BROOKHOLLOW I
HOUSTON, TEXAS
PHOTOGRAPH LOG
APRIL 25, 1996

Photograph Number	Photograph Description
25 15:39	Ninth floor, Suite 910, above ceiling, view of re-spray (non-ACM), light fixtures and cables.
25 15:44	Ninth floor, Suite 910, original fireproofing (friable) remaining at hanger attachment point, north duct run.
25 15:45	Ninth floor, Suite 910, original overspray on corrugated deck at south duct run.
25 15:47	Ninth floor, Suite 910, view of beams with re-spray fireproofing.
25 15:53	Ninth floor, Suite 910, view of demising wall and beams with re-spray.
25 15:54	Ninth floor, Suite 910, view of top of column enclosure, northeast corner.
25 16:18	Ninth floor, mechanical room, southwest corner, view of fireproofing debris on floor original and re-spray.
25 16:26	Ninth floor, Suite 950, view of replacement fireproofing above ceiling tile.
25 16:27	Ninth floor, Suite 950, view above ceiling tile of supply air ducts and replacement fireproofing.
25 16:29A	Ninth floor, Suite 950, view below ceiling tile of suite area with cable drops.
25 16:29B	Ninth floor, Suite 950, view below ceiling tile of suite area with cable drops.
25 16:33	Ninth floor, Suite 950, southeast view of column enclosure with utilities.









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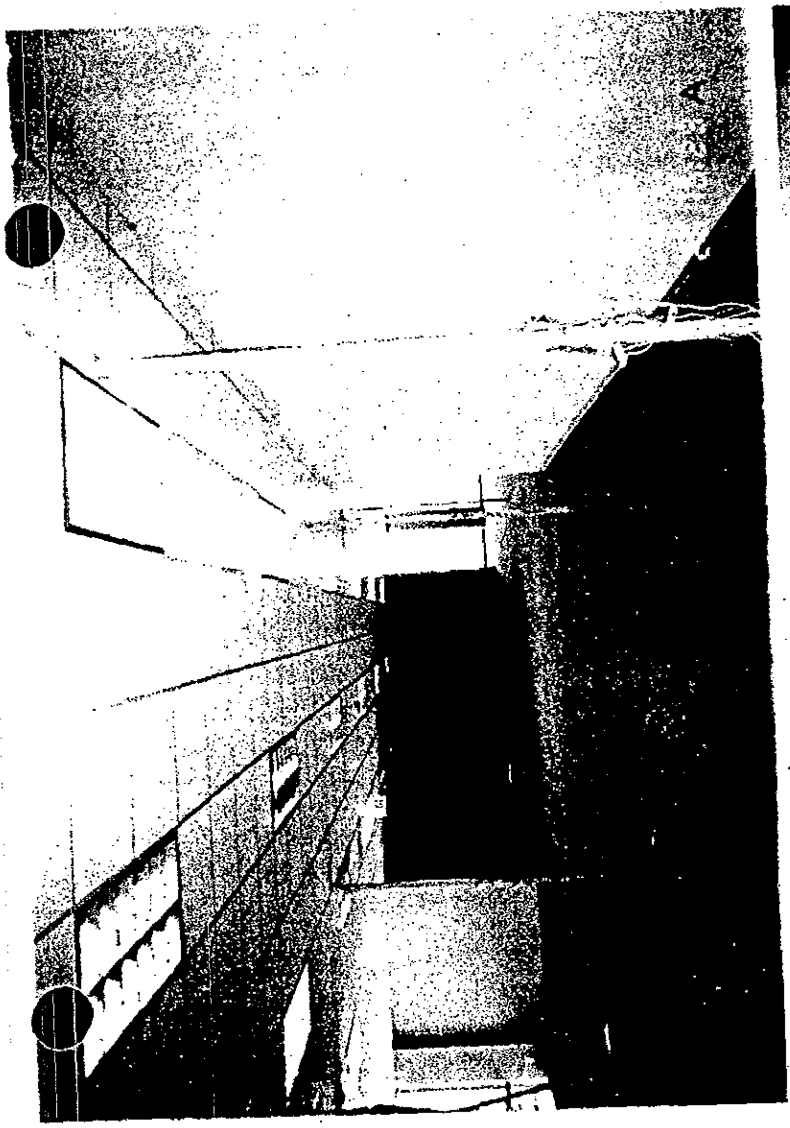
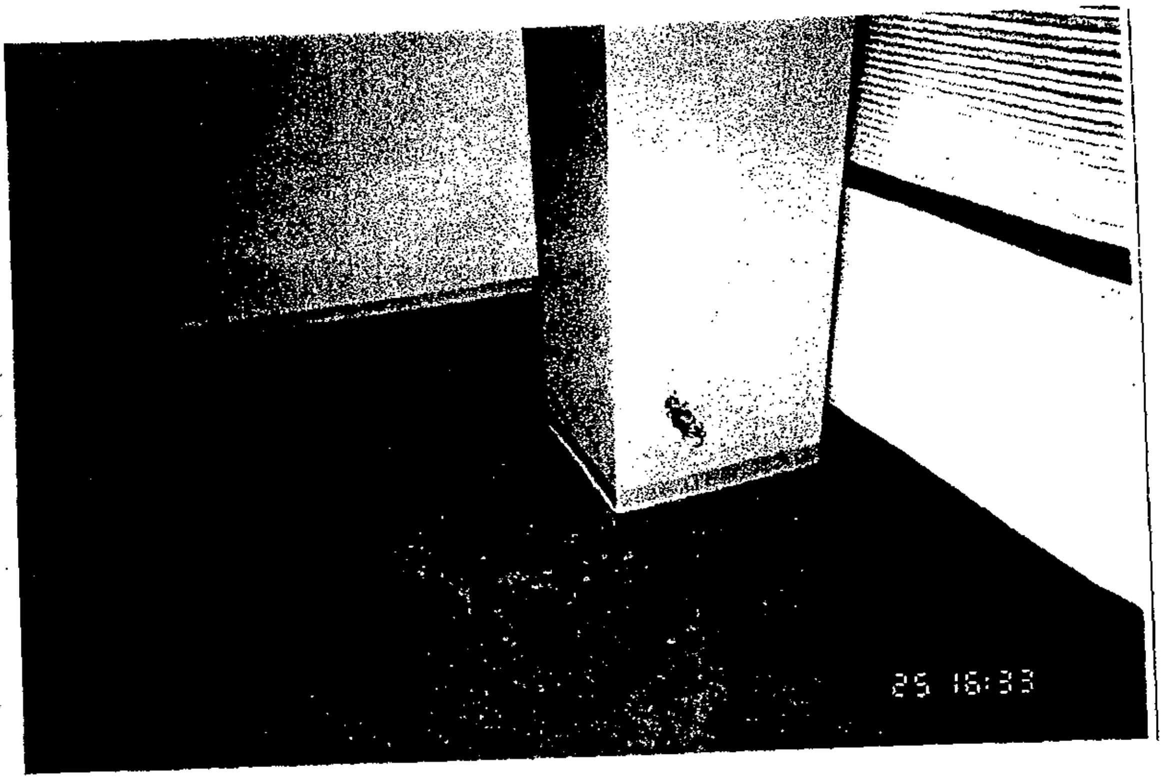



25 16:29


25 16:33

S. ROUTES OF ASBESTOS EXPOSURE IN BUILDINGS

Asbestos exposure from friable in-place materials occurs in several ways. First. asbestos fibers are slowly released through deterioration over time. In the EPA guidance document, Controlling Asbestos-Containing Materials in Buildings, they stated, "Areas covered by ACM tend to be large. If the material is friable, fibers are slowly released as the material ages."[83] This concept was also recognized in the guidance document issued by the British Department of the Environment which stated, "As it ages, sprayed asbestos may release more fibers and asbestos dust may accumulate in adjacent areas."[84]

The second common method of fiber release from in-place friable ACM is through impact or direct contact. This form of release occurs when the material is struck, scraped or brushed such as during maintenance or renovation activities. The magnitude of the release is proportional to the intensity of the activity causing the disturbance.

Once asbestos fibers are liberated from a material such as fireproofing, the fibers will slowly settle onto surfaces. If not removed, the surfaces will accumulate increasing concentrations of asbestos dust. This dust may then become resuspended into the air. Custodial and maintenance procedures such as sweeping floors with asbestos dust or changing ceiling tiles with settled dust are examples of activities which re-suspend dust into the air.

These concepts of fiber release and re-suspension are widely recognized and have been demonstrated repeatedly in observational and experimental studies.[85-90]

T. EPISODIC EXPOSURE STUDIES

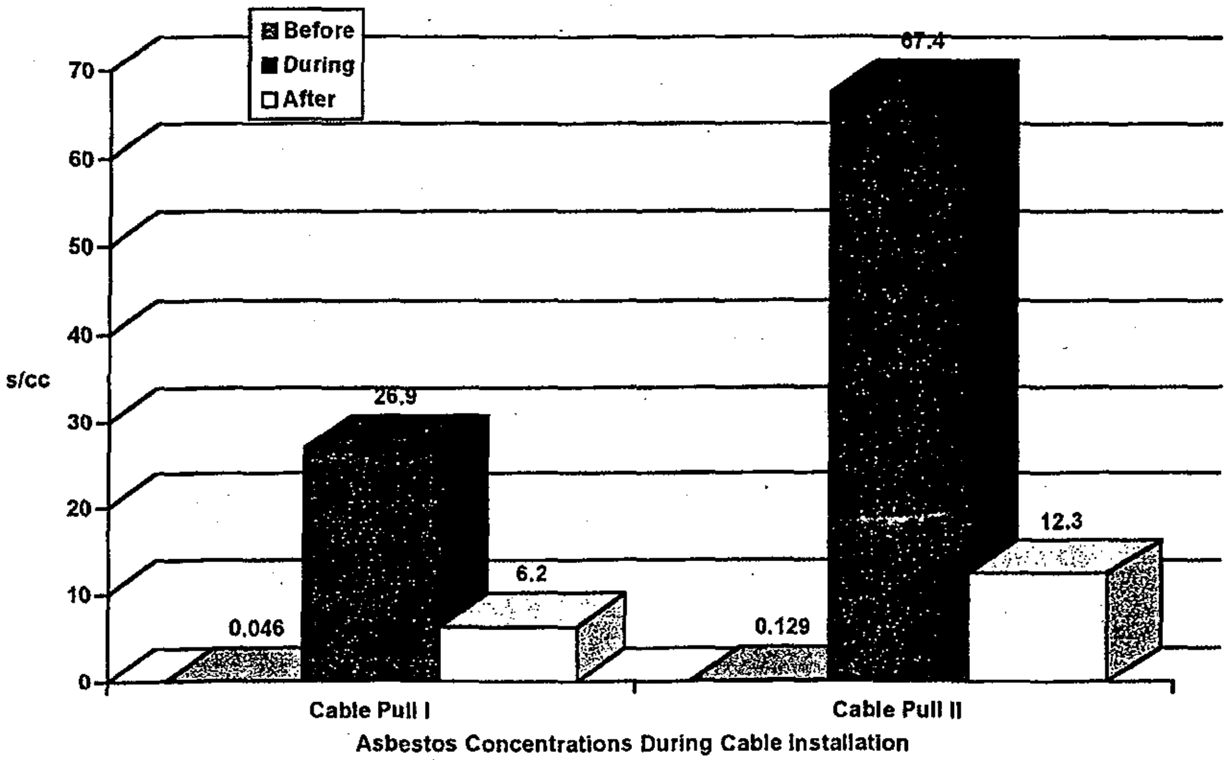
Industrial hygienists often refer to asbestos exposures in buildings as being either prevalent level or episodic. Prevalent level exposure refers to the continuous concentration of asbestos in the air. Prevalent level exposures are usually low in buildings with spray-applied fireproofing.[91-92] Area air sampling has traditionally been used to measure the prevalent level.

Episodic exposures are often associated with a specific activity which disturbs the in-place fireproofing or settled dust containing asbestos. Such exposures represent a rapid rise in the airborne asbestos concentration followed by a gradual decline.[91] Episodic exposures generally are limited to portions of the building where the activity occurs. However, ventilation patterns may distribute airborne asbestos to adjoining areas or even remote locations. Periodic air sampling in a building, such as once a year or every 6 months is unlikely to detect episodic exposures. For this reason the EPA recommends against air sampling alone for assessing the condition of asbestos-containing materials.[83,93]

In a series of studies, episodic exposures were evaluated during routine maintenance and custodial activities in buildings with surfacing ACM. Five of these studies were conducted

in buildings with spray-applied fireproofing which was the same or substantially similar to the fireproofing in the Prudential Buildings. The results of these studies have been published in peer-reviewed journals and are summarized in Figures 1 - 5.[87, 89, 90]

In each of the five studies a particular maintenance, renovation or custodial activity was chosen. Area air sampling was conducted before, during, and after each activity. Personal air samples were also collected on the individuals performing the activities. All samples were analyzed by transmission electron microscopy (TEM) and the personal samples were analyzed by TEM and phase-contrast microscopy (PCM). In each study it was found that the asbestos exposures during the activity increased significantly when compared to concentrations in the air before the activities began. In each instance, the source of the asbestos exposure was the fireproofing, or the dust and debris from the fireproofing.



DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

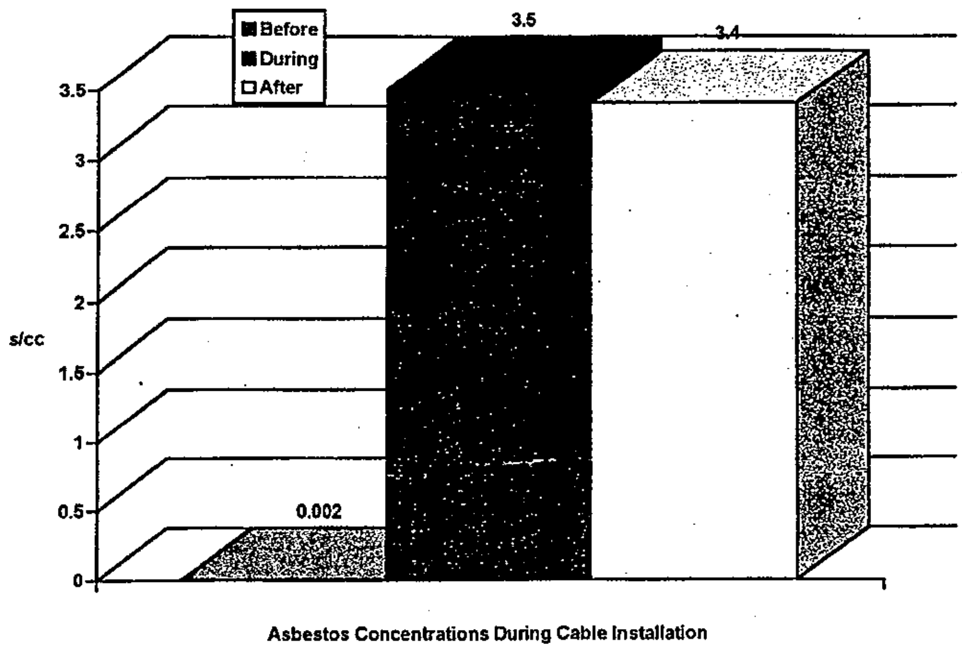
Cable Pull I

Phase	Arithmetic Mean (s/cm³)	Arithmetic Std. Dev. (s/cm³)	Geometric Mean	Number of Observations
Before Inst.	0.052	0.030	0.046	5
During Inst.	28.9	12.6	26.9	5
During (Pers.)	10.5	11.6	7.1	3
After Inst.	8.4	7.0	6.2	6

Cable Pull II

Phase	Arithmetic Mean (s/cm³)	Arithmetic Std. Dev. (s/cm³)	Geometric Mean	Number of Observations
Before Inst.	0.158	0.094	0.129	5
During Inst.	100.2	91.9	67.4	4
During (Pers.)	124.8	85.6	102.7	3
After Inst.	17.0	13.5	12.3	4

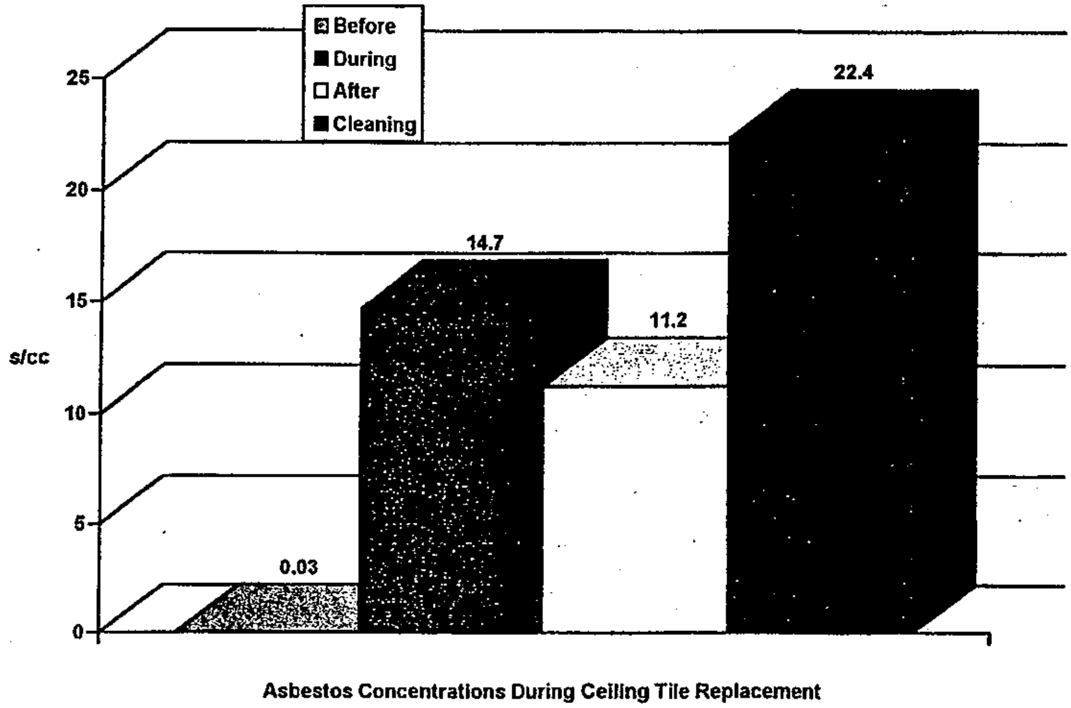
Figure 1. Episodic Exposure Results Before, During and After Installation of Cables in the Vicinity of High Density Fireproofing



DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

Phase	Arithmetic Mean (s/cm^3)	Arithmetic Std. Dev. (s/cm^3)	Geometric Mean	Number of Observations
Before	0.006	0.014	0.002	5
During (Area)	3.6	0.84	3.5	5
During (Pers.)	26	7.5	26	2
After	3.8	1.9	3.4	5

Figure 2. Episodic Exposure Results Before, During and After Installation of Cables in the Vicinity of Low Density Fireproofing

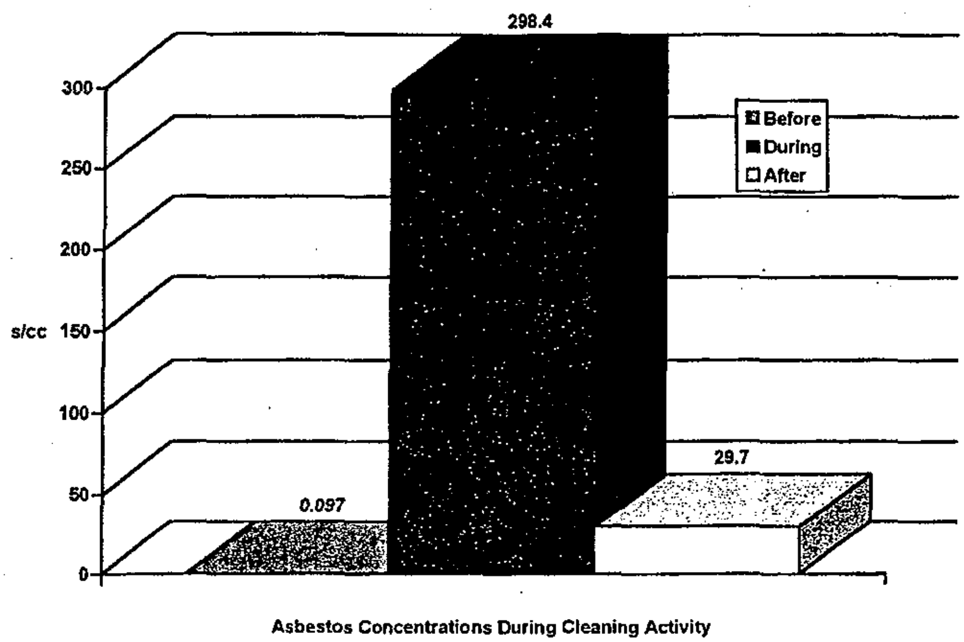


DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

Phase	Arithmetic Mean (s/cm^3)	Range (s/cm^3)	Geometric Mean (s/cm^3)	Number of Observations
Before	0.05	ND - 0.08	0.03	5
During	15.3	10 - 20	14.7	5
During (Pers.)	23.0	22 - 24	23.0	2
After	11.4	9 -14	11.2	5
Cleaning	22.4	20 - 24	22.4	5

ND = No Asbestos Structures Detected

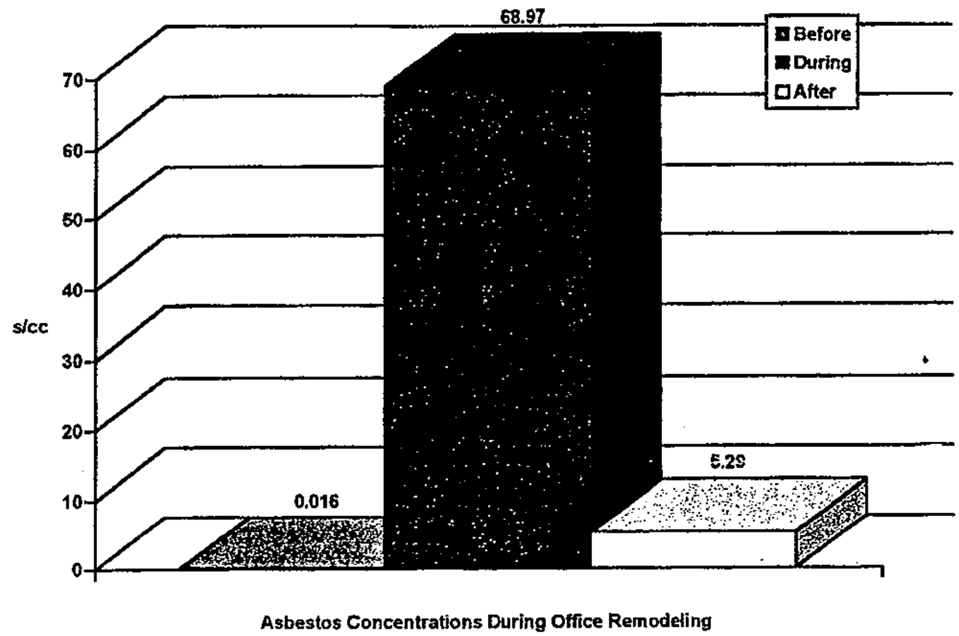
Figure 3. Episodic Exposure Results Before, During, and After Replacement of Ceiling Tiles Below Fireproofing



DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

Phase	Arithmetic Mean (s/cm^3)	Arithmetic Std. Dev. (s/cm^3)	Geometric Mean	Number of Observations
Before - Inside	0.264	0.221	0.097	5
During - Inside	329.9	173.0	298.4	5
During - Inside (Personal)	343.8	360.6	237.1	3
After - Inside	31.8	12.3	29.7	5

<u>Figure 4.</u> Episodic Exposure Results Before, During and After Cleaning a Storage Room in a Building with Fireproofing



DESCRIPTIVE STATISTICS OF ASBESTOS CONCENTRATIONS

Phase	Arithmetic Mean (s/cm^3)	Arithmetic Std. Dev. (s/cm^3)	Geometric Mean	Number of Observations
Before	0.045	0.048	0.016	5
During (Area)	73.32	27.08	68.97	6
During (Pers.)	150.79	164.68	71.60	4
After	5.81	2.39	5.29	4

Figure 5. Episodic Exposure Results Before, During and After Remodeling One Office in a Building with Fireproofing

U. MAINTENANCE AND RENOVATION EXPOSURE DATA

A review was conducted of the asbestos-related files stored at the offices of Riker, Danzig, Scherer, Hyland & Perretti in Morristown, NJ. The purpose of the review was to extract air sampling data collected during maintenance, custodial, and renovation activities in the Prudential buildings discussed in this report. No effort was made to locate data for other Prudential buildings. In excess of 375 file boxes were reviewed by William M. Ewing, CIH and Tod A. Dawson.

No custodial worker's exposure data was located for these buildings. This is not unusual since custodians have only rarely been monitored for asbestos exposure.[91] Maintenance and renovation activity exposure sampling was located for eleven buildings. These included Embarcadero Center I, Embarcadero Center II, One Chatham Center, 5 Penn Center, Renaissance Center, Prudential Plaza - Denver, Southdale Office Complex, Twin Towers, Century Center, First Florida Tower, and the 1100 Milam Building. Only the personal samples were selected from the data available for ten of these buildings. Since the data available from the Chatham Center included only two personal samples which were too heavily loaded to analyze, the area samples from this building were included. All samples included have been summarized in Tables 1 - 11 of Appendix F.

All the samples included were stated to be collected and analyzed by either National Institute for Safety and Health (NIOSH) method 7400, or its predecessor NIOSH method

P&CAM 239.[94, 95] Both methods collect airborne particles by passing air through a filter. The filter is then analyzed by phase contrast optical microscopy for fibers. Any fibers greater than 5 micrometers long, approximately 0.25 micrometers wide, and having an aspect ratio of 3:1 are included in the count. Limitations of the method include the inability to identify asbestos fibers or "see" (resolve) thin fibers/bundles of asbestos. It was and continues to be widely used since it is the "OSHA method," is inexpensive, provides quick results, and is widely available.

The work activities monitored and summarized in Appendix F include maintenance and renovation activities performed in the vicinity of asbestos-containing fireproofing. Such activities include replacing ceiling tiles, installing cables, electrical conduit and copper pipe, removing light fixtures, shooting pipe hangers, installing ceiling tile grid, removing duct work, removing walls, and clean-up activities. Efforts were made during the selection of samples for inclusion not to include samples where removal of fireproofing was occurring. The sources for the data included are listed at the end of each table and given in the Reference section of this report.[41, 42, 43, 52, 53, 59, 64, 65, 72, 73, 79, 82, 96-105]

A total of 1097 samples (1066 personal samples, 31 area samples) are included in the data set. Of these, 22 samples are reported as overloaded and 3 samples were reported voided.

Of the 1066 personal samples, 505 (47%) were greater than or equal to 0.1 f/cc and 82 (8%) were greater than 1 f/cc. These results are depicted in Figure 6. These results are

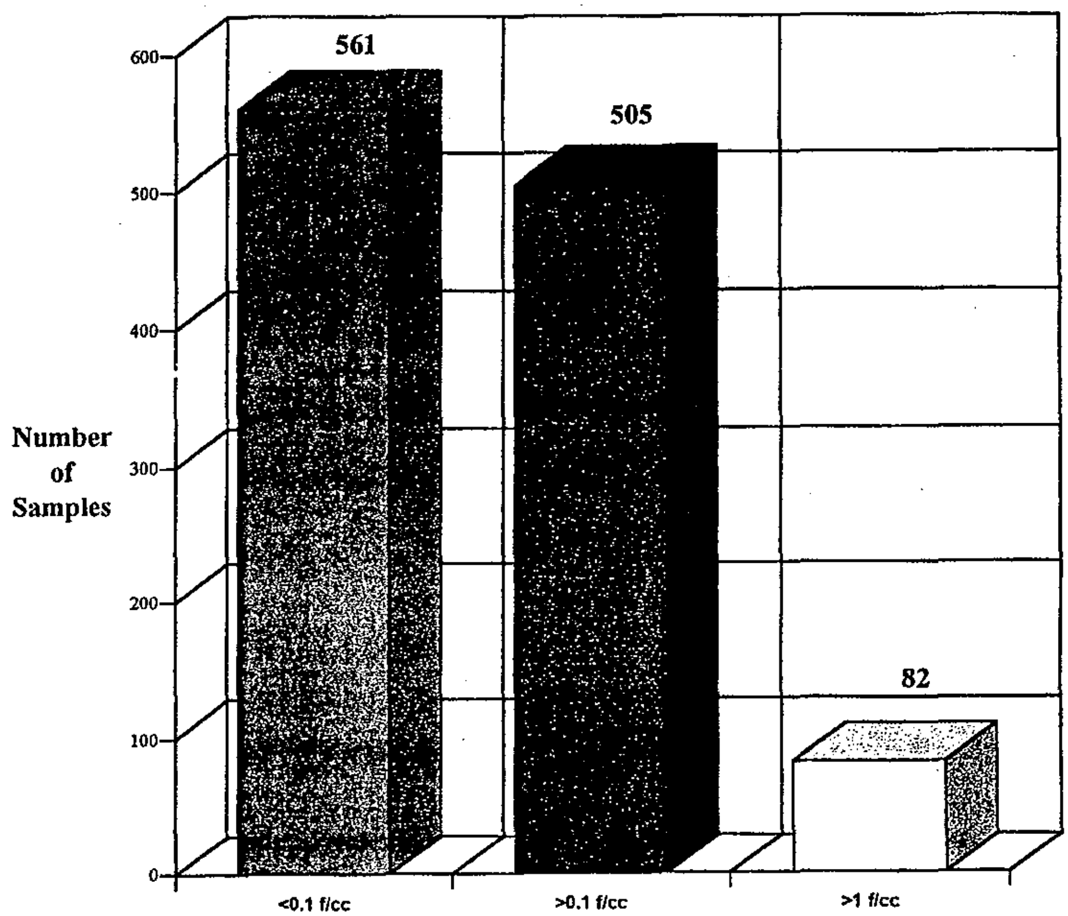


Figure 6. Distribution of Fiber Concentrations Measured on Persons Performing Maintenance and Renovation Activities in Prudential Buildings (1066 samples)

consistent with results reported in the published literature and further demonstrate that maintenance and renovation activities in buildings with spray-applied friable fireproofing routinely cause elevated airborne exposures.

V. SURFACE DUST EVALUATION

The results of surface dust samples collected and analyzed by ASTM method D 5755-95 for Embarcadero Center I, II, 5 Penn Center, Renaissance Tower, Northland Towers, and Prudential Plaza (Newark) were discussed in conjunction with the individual building site visits in this report. At 15 dust sampling locations a second sample was also collected using the method previously employed by Law Engineering, Inc. in these buildings. The sampling and analytical techniques are described in the Procedures and Methods section of this report. All results are tabulated in Appendix D and the laboratory reports included as Appendix E.

The results were evaluated and a correlation performed on the 15 pairs of sample results. For all 15 pairs a positive correlation coefficient of 0.62 was obtained with a slope of 5.165 and an intercept of 2.73×10^6. Further analysis found the correlation coefficient for three buildings (EC I, EC II, and Renaissance) to be 0.80 with a slope of 4.875 and an intercept of 3.7×10^5. When the correlation coefficient is calculated for the sample pairs collected in the remaining two buildings (5 Penn Center and Prudential Plaza - Newark) the results is 0.98 with a slope of 18.27 and an intercept of -1.16×10^5. The reason for

the correlation of the subsets to be better than the correlation of the entire set is the different slopes of the regression lines.

Basically, it was determined that the ASTM method D 5755-95 provides results 17 and 22 times greater than the earlier Law Engineering method in the 5 Penn Center and Prudential Newark buildings, respectively. In the Embarcadero Center Buildings (2) and the Renaissance Tower the increase using the ASTM method D 5755-95 was, on average, 4 - 7.3 times the Law Engineering method. In no sample was the ASTM method result lower than the corresponding side-by-side sample collected according to the Law Engineering procedure.

The one significant difference between the two methods is the sample collection. The ASTM method employs a sample nozzle with a known diameter of 0.63 cm and a flowrate of 2.0 l/min. This provides a face velocity at the point of dust collection of 106 cm/sec. The Law Engineering method used an open face 37 mm cassette with an effective collection area (diameter) of 33 mm. Also operating at 2.0 l/min, this provides a face velocity at the point of dust collection of 6.4 cm/sec. Accordingly, the ASTM method provides a face velocity over 16 times the face velocity of the Law Engineering method.

A total of 1053 asbestos structures were identified, characterized and sized in the 30 samples. No asbestos structures were detected in the 8 blank (control) samples. Each asbestos structure was characterized as either a bundle, matrix, cluster, or fiber. Table 2.

depicts the distribution of structure types for all samples. It is apparent that the two methods produce rather similar asbestos structure distributions when dusts of similar composition are analyzed. The only reasonable explanation for the ASTM method producing consistently higher results is the improved collection efficiency gained with the higher face velocity at the point of sample collection. Visually this was apparent in the field since considerably more dust remained behind on surfaces sampled with the Law Engineering method than the ASTM method D 5755-95.

On average it was determined that the ASTM method provides results 11 times greater than the Law Engineering protocol. This observation should be considered when evaluating previous dust sampling results collected by Law Engineering in the late 1980's in these Prudential buildings.

Table 2. Asbestos Structure Distribution for 30 side-by-side Surface Dust Samples

Structure Type	Law Method	ASTM Method
Bundles	50 (8.1%)	42 (9.7%)
Clusters	26 (4.2%)	8 (1.8%)
Matrices	267 (43.2%)	170 (39.1%)
Fibers	275 (44.5%)	215 (49.4%)
Totals	618 (100%)	435 (100%)

W. ASBESTOS MANAGEMENT OPTIONS AVAILABLE TO COMMERCIAL BUILDING OWNERS

There are several options available to building owners when developing a policy to manage asbestos-containing materials in buildings. In the short term, implementation of an operations and maintenance (O&M) program is necessary. An O&M program is a set of procedures and practices designed to reduce exposures to in-place asbestos while continuing to operate the building. Such a program requires specific work practices when working in the vicinity of asbestos, training of personnel, use of personal protective equipment, proper disposal techniques, and other elements.[106] Prudential has developed or adopted O&M programs for buildings containing friable asbestos-containing materials.

In the long-term, a permanent solution is developed and implemented. For asbestos-containing fireproofing the options include encapsulation, enclosure, and removal. Of these, only removal is truly a permanent solution. Encapsulation, the spraying of a sealant on the fireproofing, does not prevent future damage or delamination, is costly, and may void the fire rating of the material. Enclosure, an airtight barrier constructed around the fireproofing, is not a feasible option in the vast majority of the Prudential buildings due to the lack of space in which to build the enclosures. Enclosures would also be very costly. The advantages and disadvantages of each option have been reported by the EPA.[83]

From the viewpoint of an industrial hygienist, removal of the asbestos-containing fireproofing with substitution of a less hazardous material is preferable. Industrial hygiene is the science that deals with occupational health hazards and environmental stresses of a chemical, physical and biological nature. Its focus is the recognition, evaluation and control of these hazards. When an industrial hygienist considers control options, there exists a hierarchy. The first option in the hierarchy is elimination of a hazard through substitution. If this is not feasible, the hazard should be reduced or eliminated through other engineering controls. If this is not feasible, the hazard is reduced through personal protective equipment such as respirators. The use of respirators is the last option since it relies upon workers to use and maintain them properly.[107]

The EPA requires friable asbestos-containing materials be removed from a building prior to renovation or demolition activities which will disturb these materials.[108] Ultimately, all the asbestos-containing fireproofing will need to be removed properly from the Prudential buildings. The real question presented to the building owner is when should the removal be conducted. The options are immediate removal, phased removal over a period of time, or removal at the time of demolition.

A formal policy for asbestos in Prudential buildings was first adopted in July 1986.[109] While this policy referred to "hazardous substances," asbestos in buildings was one of the major focuses. The policy called for the following:

1. Investigate existing and perspective properties
2. Evaluate the scope of the hazard
3. Notify affected parties
4. Establish monitoring systems
5. Remove hazardous substances, if practical or necessary, as expeditiously as possible.

By this time, Prudential had completed a nationwide survey of its investment properties for asbestos, conducted by outside consultants. Concurrent with this policy statement, the Prudential Realty Group established a permanent task force to develop guidelines for handling hazardous substances issues.(109)

In June 1987 the task force issued its "Policy Guidelines and Operating Procedures Manual."(110) This manual provided greater detail and guidance for implementing the policy, as well as a structured system of oversight. The following summarizes the guidance provided for asbestos in Prudential Buildings.

1. Conduct a bulk sampling survey
2. Conduct an exposure and risk assessment
3. Implement an Operations and Maintenance Program
4. Provide training
5. Notify affected parties

6. Take immediate action (abatement) if there is a current health hazard
7. Continue inspection/monitoring and anticipate abatement in conjunction with renovation activities
8. Conduct abatement activities in compliance with all OSHA, EPA, state and local regulations/guidelines
9. Use qualified consultants/contractors
10. Maintain various records

At this stage of policy development the "exposure and risk assessment" of in-place asbestos-containing materials relied largely on the results of area air sampling. No trigger value was stated in the guidelines delineating a hazardous situation from a non-hazardous one.

The guidance manual was continually revised and updated. In March 1990 a detailed scope of work for performing bulk sampling and assessments was issued.(111) This document makes it clear that Prudential will follow the bulk sampling procedures outlined in the EPA AHERA regulations for schools. This document further requires a written material assessment be performed based on the same criteria used in the AHERA regulations. The document does not require the material be placed into one of the seven AHERA assessment categories. A similar specification guideline was also issued for asbestos abatement projects in 1990.(112)

In May 1993 the guidance manual underwent a further revision that provided additional guidance regarding types of abatement and when to perform abatement.[113] The document lists four instances when asbestos abatement will generally be required. These are as follows:

1. health hazard as determined by a consultant

2. federal or local regulations (e.g., in conjunction with demolition or a building or other disturbance of the ACM)

3. market forces (e.g., tenants will not lease the space unless the ACM is removed)

4. a cost-benefit analysis indicates it is the most appropriate choice (e.g., removal prior to renovation or installation of a sprinkler system may be more cost effective and safer than working around the material)

Throughout the evolution of the Prudential asbestos policy, emphasis is placed on the fact that each building is unique and decisions regarding asbestos should be evaluated and made on a case-by-case basis. It is also recognized that state asbestos regulations may mandate certain procedures in one building while others may be required in a different state.

In general, the approach in the Prudential buildings has been a phase-out of the asbestos-containing fireproofing over time. Generally this has been done in conjunction with planned renovation activities. In a 1990 EPA guidance document the EPA stated the following.

> Removal of ACM may also be appropriate when performed in conjunction with major building renovations, or as part of long-term building management policies (such as staged removal in conjunction with renovations over the life of the building, as covered by the EPA NESHAP requirements for removal before demolition or renovation).[93]

One obvious exception to this policy concerns the Prudential buildings in Short Hills, NJ. Due to the planned imminent demolition of the building, immediate complete removal was the only option available. In the case of the Hunt Valley Marriott the fireproofing removed was that which was judged to be in poor condition and/or readily accessible. The remaining fireproofing was either inaccessible or was encapsulated and enclosed to prevent fiber release. There exists a similar situation for the perimeter columns at Chatham Center.

The general approach to asbestos-containing materials in these Prudential buildings is similar to and consistent with the actions of other large building owners and managers in

the United States. A 1989 study sponsored by EPA reported that approximately 50% of the buildings in the survey had been inspected for asbestos.[114] In those buildings where asbestos was found, 75% had conducted same asbestos abatement actions. The majority of these were performed in conjunction with renovation activities.

Many owners and managers of large buildings evolved policies similar to Prudential during the late 1980s. Examples include the General Services Administration, the Defense Department, and the Centers for Disease Control. Each of these owners inspected their facilities for asbestos, implemented an operations and maintenance program, and have conducted removal of fireproofing and other asbestos-containing materials. In most instances the removal was performed in conjunction with building renovation activities.

Documents related to asbestos management procedures followed by W.R. Grace & Company, U.S. Mineral Products Company, and U.S. Gypsum were reviewed. Depositions of representatives from these companies were also reviewed. Discussed below are summaries of policies and procedures supported by examples of asbestos management activities in their buildings.

W.R. Grace has established a policy regarding asbestos-containing materials in Grace Premises.. Mr. Harry Eschenbach, Director of Health, Safety and Toxicology for W.R. Grace & Company, indicated that asbestos abatement projects have been conducted in 100

to 150 Grace facilities. In some of the larger facilities, asbestos abatement has been done in numerous locations.[115]

The types of asbestos-containing materials (ACM) that have typically been removed include fireproofing, floor tile, thermal system insulation, gaskets and transite. Removal has been conducted when ACM is damaged or deteriorated, in association with renovations, and prior to demolition. Mr. Eschenbach indicated there were occasions when ACM which was in good condition was removed at the same time as damaged ACM because it was cost effective.[115]

The general factors considered in deciding to remove ACM include government regulations, the condition of the material, and the potential for exposure to building/facility occupants.[115]

Mr. Eschenbach acknowledged that it is Graces' responsibility under OSHA to inform employees about the materials they work with. This is done at the Grace facilities either by a facility survey to identify ACM or a "piece-by-piece" basis as situations arise.[115] W.R. Grace provides training at its facilities to employees who work around ACM. This includes maintenance personnel who work above drop ceilings where asbestos-containing fireproofing is on the structural steel and/or the deck. The degree of training depends on the type of work performed.[115]

A review of Grace documents pertaining to removal of ACM in various facilities provides some examples of the circumstances under which asbestos removal was conducted in Grace premises.

A September 29, 1986 memorandum by H.A. Eschenbach outlines his conclusions regarding fireproofing material at the Bridgewater, New Jersey facility. Mr. Eschenbach had visited the facility on September 25 to inspect the fireproofing and collect samples.(116)

Mr. Eschenbach described the material as containing 15% chrysotile asbestos, mineral wool and some cellulosic fibers. "The material is extremely friable which means it falls from the beams and ceiling at the slightest touch."(116)

Mr. Eschenbach recommended removal of the material. "Eventually, it will have to be removed -- either because of governmental regulation or because its bonding abilities deteriorate to the point that it can no longer be ignored. Further, continued use of the area, especially if it involves construction of rooms and storage areas with ancillary wiring changes and other modifications, will be much more expensive in order to work around the asbestos-containing material with minimal worker exposure. Asbestos-containing material as friable as this is mandates a "management program." This involves, among other things, periodic air sampling to make sure that exposure levels remain low and a system of permits to preclude any work which might disturb the asbestos-containing material from being done without adequate safeguards and training of the workers

involved. Removal will allow much greater freedom in making use of the basement area and eliminate the need for ongoing elaborate inspection and control systems with their burdensome administration requirements."(116)

An October 13, 1988 memorandum describes the subsequent asbestos removal project conducted at the Baker & Taylor, Bridgewater, NJ facility (a Grace company).(117) Approximately 5,600 square feet of fireproofing (15-25% chrysotile) applied to the metal decking of the ceiling in the first floor storage/mechanical room was removed. The memo indicates that air testing conducted on several occasions was 0.002 f/cc. "These readings indicated that the air did not have any asbestos fibers, and that the air was equivalent to outside air."(117)

The memo states that although air testing indicated no problem and there were no existing regulations requiring removal, Baker & Taylor's senior management felt that "We should remove the material, just to be on the safe side." "The other alternative, encapsulation of the offending area, was rejected because it was merely a stopgap measure. Management opted for a long-term solution, rather than a short term plan."(117)

Baker & Taylor issued Purchase Order 8189 to Eastern Environmental Services of the Northeast, Inc. for $63,570 to conduct the removal work and provide $10 million of Occurrence General Liability Coverage.(118)

Asbestos was removed in conjunction with renovation activities at the W.R. Grace headquarters building in New York. Proposals were submitted by Primo Construction, Inc. to W.R. Grace & Co. for construction cost for the 46th floor alteration at 1114 Avenue of the Americas in 1987.[119] The proposals indicate the alteration involved a variety of general contract work such as drywall, ceilings, taping and cleaning, electrical, painting, carpeting and base, and demolition and asbestos removal. The proposals indicate an allowance of $40,000 to $45,000 was made for asbestos removal and related work in the Conference Room on the 46th Floor.

A letter from Brian J. Smith, Senior Vice President of W.R. Grace & Co. to Mr. John O'Brien of Primo Construction indicates that the project was approved.[119] It specifically references the 46th floor Conference Room where asbestos removal was scheduled to be conducted on October 8-12, 1987.

Following this abatement activity, on December 4, 1987 an evaluation was made of procedures for incidental contact with asbestos-containing materials in the Headquarters Building of W.R. Grace & Company.[120] This evaluation was conducted by Peter L. Zavon, a Certified Industrial Hygienist with Agatha Corporation.

The evaluation was limited to floors 4, 5 and 41-48, which were the floors occupied by W.R. Grace & Company. The evaluation included observation of telephone technicians' work and a discussion with W. R. Grace personnel of other activities conducted above the

suspended ceiling. Personal air sampling was performed on telephone technicians as they accessed the space above the suspended ceiling to pull telephone wires. In addition to telephone company personnel, the report indicated some or all of the five maintenance staff might have need to work above the ceiling.

The report noted that fireproofing reported to contain asbestos was sprayed on beams and slab decking. Fiberglass, tongue-in-groove tiles formed a suspended ceiling about three feet below the slab. Small pieces of fireproofing were seen on the upper surfaces of the tile. All tiles were considered potentially contaminated.

Recommendations listed in the report included establishment of formal Respiratory Protection and Asbestos Operations and Maintenance Programs. In addition, more refined techniques for entry above the suspended ceiling were suggested.[120]

A W.R. Grace & Company memo from P.J. Walsh to R.P. Turner discusses the need to remove asbestos-containing insulation from the underside of the roof and peaked wall areas at both ends of the dry storage warehouse (Bldg. # 10) at the North Bergen, NJ facility. Insulation was also applied on the east and west walls to a level 4.5 feet down from the top of the wall. The memo indicates the ¾ inch thick insulation was composed of mineral wool and chrysotile asbestos.[121]

The insulation had been damaged by forklift activities and there was concern that the insulation could fall to the floor and be spread around the warehouse on the fork truck tires without the operator being aware of it. The memo also indicates make-up air was drawn from inside the building at the base of one of the sprayed walls and air movement in the area was substantial. "Due to the damage and the material's highly friable nature, removal seems to be the most viable alternative."(121) The memo also discusses the differences between cementitious and fibrous asbestos-containing products with respect to management options.

A document titled Airborne Asbestos Monitoring, W.R. Grace, North Bergen, New Jersey was prepared for Joe Miller of Finishing Touch Asbestos Abatement Corporation, Inc.(122) This document indicates air monitoring was conducted in conjunction with asbestos removal in Warehouse No. 10, North Bergen, NJ on October 1, 1986. Finishing Touch had submitted a proposal on June 11, 1986 for removal of approximately 5,780 ft^2 of asbestos containing insulation from the underside of the roof and beams in the warehouse storage area at North Bergen.(123) The proposed removal price was $31,450.

A request was made for appropriations to remove asbestos insulation from the old #2 and #3 festoons in the Quakertown, PA facility in 1987.(124). The content of the insulation was reported as 80-90% asbestos in a ratio of 8:1 chrysotile and Amosite. The request indicated that much of the insulation was damaged. "In light of the fact that both pieces of

equipment are permanently idle we propose to have all insulation removed and disposed of by a certified asbestos specialist."[124]

A purchase order was issued to Asbestos Removal and Hazards Control to remove the insulation from the festoons and transite paneling from exterior oven walls and partition walls between ovens.[125] The cost for this work was $33,468.

A deposition taken of Mr. James P. Verhalen on September 21, 1995 indicated that U.S. Mineral had no formal written policy with regard to asbestos in company owned buildings. When asked, "Does U.S. Mineral Products Company ever believe that it's appropriate to remove asbestos-containing material during renovation?" Mr. Verhalen replied, "Sometimes you have to. There is no avoiding it. And sometimes you have to. I think it's foolish to remove asbestos-containing materials if you don't have to." Mr. Verhalen cited the following example of when ACM would have to be removed. "If ACM is applied to a ceiling and the ceiling is going to be removed, the ACM must be removed."[126]

When asked if U.S. Mineral believes there are times when it is appropriate to abate and remove asbestos-containing fireproofing material from a building, Mr. Verhalen replied that generally, U.S. Mineral supports the Federal government's position on operations and maintenance (in-place management) and removal. "Therefore, circumstances where it's safe and sound and economical and practical to remove asbestos-containing materials."[126]

When asked if U.S. Mineral held the position that no precaution need to be taken when ACM is disturbed during renovation, Mr. Verhalen replied "No".[126] He indicated that U.S. Mineral supports the maintenance and operations regulations that are federally required and the EPA Greenbook. He stated that these regulations are "practical, logical and safe."[126] Mr. Verhalen also stated that U.S. Mineral supports monitoring in-place ACM as part of the Federal government program. "Monitoring I believe is always desirable."[126]

U.S. Mineral monitored ACM in its own building in the early 1970's when the transition was taking place between asbestos and non-asbestos products. Initially, just air testing was done. Later written procedures for air monitoring were developed when the government programs became more formal. In recent years a map was drawn of the plant and locations of asbestos-containing material were identified.

According to Mr. Verhalen, there are two U.S. Mineral office buildings that have asbestos-containing material above suspended ceiling systems and "they're not subject to any exposure or risk." Air sampling for asbestos was done in late 1994 or early 1995 at the Stanhope office which has Cafco Heat Shield applied to a metal skin roof. The results were negative. However, monitoring is done if someone goes above the suspended ceiling.

All ACM was removed in approximately June of 1995 from factory metal skin buildings. The metal skins on the Butler buildings needed to be replaced. According to Mr. Verhalen, it was necessary prior to replacing the metal skins to remove the asbestos.[(126)] Other removals conducted at U.S. Mineral facilities include thermal system insulation from a boiler that was replaced (1987, 1989) and removal of ACM in conjunction with a roof replacement (approx. 1990).[(126)]

In May 1984 U.S. Gypsum (USG) issued a document to all US plants titled "Managing an Asbestos Control Program, Maintaining in Place".[(127)] The memo attached to the guidelines stated, "The past use of asbestos in insulation, and in other products, presents a problem for plants, both in maintaining safe conditions in areas where the material was used, and in its removal when necessary. The objectives in any asbestos control program are to protect all persons from exposure to airborne fibers in all sections where asbestos is present, and if removal is necessary, to remove and dispose of the material in the manner prescribed by Federal Regulations."[(127)] These guidelines directed plants to survey and identify ACM; identify ACM that appeared to be damaged or needed repair; repair material that could be repaired; and if material was damaged beyond repair it was to be removed.

An Asbestos Compliance Guide dated February 18, 1986 was distributed to all plant managers. This guide provided instructions on conducting renovation and demolition work involving ACM. This document was revised on June 22, 1987 to include a re-

statement of the Corporation's policy to maintain asbestos-containing materials in place, unless removal is necessary.[128] In the "Purpose" section it is stated, "The intent of these guidelines is to assist plant management in situations where removal is necessary. This includes preparations for capital installations, revisions of equipment arrangements or where asbestos-containing material is damaged beyond repair."[128]

At least 15 different removal projects took place between July 1983 and February of 1985. In May of 1985 there were numerous capital expansion projects at USG plants which required ACM removal.[129]

A July 9, 1984 memorandum from M.J. Bagel to S.T. Hadley of USG provides information on a seminar by the Building Owners Managers Association titled "Asbestos In Office Buildings - A Tenant's Problem, and an Owner's Problem."[130] At the end of the memorandum Mr. Bagel states, "I believe the above provides sufficient information to alert management to the fact that there is a potential problem in buildings that contain asbestos materials. On the basis of this information I believe that a meeting should be held as to what steps if any will be taken should asbestos material be found in the USG building."[130]

The Headquarters Building at South Wacker Drive in Chicago contains Firecode fireproofing. A building committee was formed to handle asbestos problems at the Headquarters Building. A document titled "USG Building, Interim Report, Modifications

to Permit Interior Work" introduced in Mr. May's deposition describes the situation: "A problem identified with doing any above ceiling work on floors two through 16 is that when the fireproofing insulation is disturbed, as by changing pipes, wiring or supports for ducts, ceiling, lighting or other utilities, installing partitions within the plenum to isolate a space for separate air-conditioning and the like, asbestos fibers contained in the fireproofing insulation may be released. This can be caught up in the circulating air within the plenum and thereby distributed to the entire floor, recirculated through the return ducts and ultimately spread throughout the entire building."(129) USG called upon Dr. Morton Corn to assist them in dealing with the ACM in the Headquarters Building.(131) Clayton Environmental conducted air monitoring at the Headquarters Building on January 4-6, 1985. Eighty samples were collected and analyzed by phase contrast and transmission electron microscopy.(132)

A memo dated September 2, 1987 from D.E. Warrick to J.D. Cornell discusses the need for a written facility plan relating to the inplace asbestos-containing material in the Headquarters Building.(133) Mr. Warrick stated, "I would feel much better if we had a written plan to be followed by our own maintenance staff as well as outside workers."(133)

In summary, the procedures for management of asbestos in buildings which are used by W.R. Grace & Company, U.S. Mineral Products Company, and U.S. Gypsum are similar to those implemented by Prudential. All have conducted inspections in their buildings,

have instituted asbestos control procedures, and have removed asbestos-containing materials in conjunction with renovation and demolition activities.

X. REGULATIONS

The management and removal of the asbestos-containing fireproofing in the Prudential buildings are subject to numerous federal, state and local regulations. At the federal level the two major regulations are the Occupational Safety and Health Administration (OSHA) asbestos standard (29 CFR 1926.1101) and the EPA asbestos NESHAP standard.[134, 135] In addition, the US Department of Transportation (DOT) standards for the transportation of hazardous materials impact the buildings as well as the EPA Asbestos Hazard Emergency Response Act (as amended) (AHERA) regulations which pose additional burdens on the buildings.[136, 137]

The newly revised OSHA asbestos standard has further reduced the permissible exposure limit (PEL) to 0.1 f/cc based on an 8-hour, time-weighted average (TWA).[134] This standard also requires work practices (regardless of exposure concentration) be implemented when working around or on asbestos-containing materials. It was noted by OSHA in the preamble to the current revision that significant risk remains at the 0.1 f/cc level.

The new OSHA asbestos standard provides a classification of work activities. Class I work includes removal of surfacing materials (such as fireproofing) and thermal system insulation (such as pipe and boiler insulation). Class II work includes removal of asbestos-containing materials such as flooring, wallboard and roofing products. Class III work

includes repair and maintenance operations where ACM is likely to be disturbed. Class IV work includes clean-up of asbestos waste and debris.(134)

The work practices required under the OSHA asbestos standard are progressively more stringent, with Class IV work the least stringent, and Class I work the most stringent. The removal of fireproofing from a building is Class I work. This work must be conducted by trained workers and supervisors, employ a negative pressure containment system, provide for the use of respirators and protective clothing, and numerous other requirements.(134)

Custodial and maintenance activities which involve asbestos-containing fireproofing generally fall into Class III or Class IV work. Class III work usually requires isolation of the work area, use of respirators, specific work practices, a competent person (as defined by OSHA) on site, and trained employees and supervisors. Class IV work requires trained employees and specific work practices but does not mandate the use of respirators.(134)

The new OSHA standard contains numerous other provisions including notification and labeling requirements, medical surveillance of employees, decontamination procedures, testing requirements, and waste disposal procedures. The standard represents the latest revision to the OSHA asbestos standards providing for greater stringency in the requirements. It lowered the permissible exposure limit (PEL) to 0.1 f/cc from 0.2 f/cc (8-hour, TWA) which had been in effect since July 1986. Prior to this time the PEL was 2 f/cc, expressed as an 8-hour, TWA.

The EPA NESHAP asbestos standard has likewise evolved and become more stringent over the years.[135] In summary, the standard requires building owners and operators to properly remove friable asbestos-containing materials prior to renovation or demolition activities which will disturb these materials. It further regulates the method of removal and disposal of the asbestos waste.[135]

In addition to the federal asbestos regulation, all of the buildings discussed in this report were, or are subject to one or more state asbestos regulations. Like the federal regulations, the state asbestos regulations have evolved over the years, beginning in the mid-1980s.

The provisions of the state regulations have been summarized repeatedly by the National Conference of State Legislatures (NCSL) under a grant from the EPA.[137, 138] The Bureau of National Affairs (BNA) has also provided a history of early state asbestos regulations.[139] Certain cities and localities, such as New York City, Dallas, Philadelphia, and Allegheny County (Pittsburgh) also passed regulations regarding asbestos in buildings.

Among these regulations the common issue was the provision for certification of individuals who perform various asbestos-related activities. In many states formal licensing programs were established. Initially, some programs only applied to school buildings. However, when the EPA AHERA regulations were amended, public and

commercial buildings were included nationwide in the Model Accreditation Plan (except for Management Planners).[140]

The Prudential buildings discussed in this report contracted maintenance and renovation work. The state regulations required work involving the disturbance of asbestos materials be performed by certified or licensed personnel. Accordingly, it became common practice for only certified workers to conduct asbestos activities in the vicinity of the fireproofing in Prudential buildings.

Some states were also delegated authority from OSHA and EPA to implement and enforce their own OSHA asbestos standard and NESHAP standard. For these Prudential buildings, the states of California, Maryland, Michigan, Minnesota, and New York have state OSHA programs. In these states, the regulations must be at least as stringent as the federal standard. Most states adopted the federal OSHA asbestos standard(s) with little modification. However, using California as an example, CAL-OSHA redefined an asbestos-containing material as greater than 0.1% asbestos, and require all asbestos workers to be registered with the agency.[141, 142]

California also has adopted, and revised the EPA asbestos NESHAP standard. For Embarcadero I and II, located in San Francisco, they must comply with the Bay Area Air Quality Management District (BAAQMD) NESHAP requirements.[143] This regulation

significantly lowers the threshold for amounts of friable asbestos involved in renovation or demolition activities.

City regulations have also impacted Prudential's management of asbestos in their buildings. New York and Philadelphia's comprehensive asbestos in buildings regulation have no threshold amounts before they are applicable.[144 - 146] The City of Dallas has adopted the rules of the Texas Air Control Board.[147 - 149]

The multitude of federal, state and local regulations creates difficulty for large building owners and operators with holdings in many states and localities. At the building level, it is necessary to develop a site-specific plan to achieve compliance with the regulations. At the national level, policies must be appropriate and flexible to allow for provisions of various regulations to be met.

IV. CONCLUSIONS

The following conclusions are based on site visits to the Prudential buildings, results of bulk, air, dust and debris samples, interviews with building management representatives, and reviews of asbestos-related building documents applicable standards, regulations, guidance and research.

1. The spray-applied asbestos-containing fireproofing currently or formerly present on structural steel (and/or the decking) is friable.

2. In all buildings assessed pursuant to the EPA assessment protocol, the fireproofing was in the vast majority of areas rated as "damaged friable surfacing asbestos-containing building materials."

3. In all buildings assessed, the original asbestos-containing fireproofing had both physical damage and damage due to deterioration. Instances of water damage and delamination were evident at some locations.

4. In all buildings assessed and in which testing was performed it is concluded that asbestos has released from the fireproofing. This asbestos dust and debris has accumulated and resulted in significant contamination of building surfaces.

5. Studies have demonstrated that routine maintenance, custodial, and renovation activities that disturb in-place fireproofing or accumulated dust and debris from the fireproofing can result in elevated airborne asbestos exposure to the workers and others in the vicinity of the work.

6. Air sampling data from these Prudential buildings demonstrates that elevated exposures have occurred among workers performing maintenance and renovation activities.

7. These Prudential buildings are subject to the federal OSHA standard, EPA asbestos NESHAP standard, the applicable state regulations for the states in which the buildings are located, and local (city and county) ordinances for some buildings.

8. It has been necessary and prudent for Prudential to develop and implement asbestos management plans, including asbestos operations and maintenance programs to continue operating these buildings.

9. The removal of the asbestos-containing fireproofing following a phased approach has been, and continues to be, appropriate and reasonable.

10. The Prudential asbestos policy, and implementation of that policy is consistent with applicable regulations, standards, guidelines, and the actions of other major property owners.

This report prepared by: William M. Ewing

William M. Ewing, CIH
Technical Director

BCM Converse Inc.

Engineers, Planners and Scientists

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March 28, 1986

FILE

Mr. Mike Moore
Property Management Systems
2900 North Loop West, Suite 101
Houston, Texas 77092

RE: Brookhollow Golden I
Phase I
BCM No. 05-4151-04

Dear Mr. Moore:

Project clearance testing has been completed for the above referenced project. Air samples were collected and analyzed by BCM Converse Inc. These samples were analyzed using procedures of NIOSH P & CAM 7400 and meet asbestos air clearance levels of Section 02071 of the BCM specifications.

Enclosed is a copy of the BCM Air Monitoring sheet and the Procedure for Fiber Counting. If you should have any questions, please call.

Yours very truly,

BCM CONVERSE INC.

Kyle E. Parker, P.E.
Project Manager

/sce

Enclosure

BCM CONVERSE INC.
AIR MONITORING DATA REPORT

Proj.No. 05-4151-04

Date	Sample Number	Description	Pump No.	Sampling Per. Start	Sampling Per. Stop	Sample Time Min.	Cal. Flow Rate	Sample Vol. liters	Fibers Counted	Minimum Fiber Count	Result fiber
01/09/06	01	Background-1st Floor South Side	32	13:50	17:50	240	9.8	2,430	8.5	10.0	[illegible]
01/09/06	02	Background-1st Floor East Side	34	13:52	18:00	248	10.2	2,530	12.0	12.0	[illegible]
01/09/06	03	Background-1st Floor West Side	31	13:55	18:02	247	10.1	2,495	7.5	10.0	[illegible]
01/11/06	04	Background-4th Floor North Side	32	11:20	15:30	250	9.8	2,520	8.5	10.0	[illegible]
01/11/06	05	Background-4th Floor East Side	34	11:23	15:40	257	10.2	2,621	3.5	10.0	[illegible]
01/12/06	06	Neg Air Ck-5th Floor Stairwell	34	13:05	17:35	270	10.2	2,754	6.5	10.0	[illegible]
01/13/06	07	Neg Air Ck-5th Floor Stairwell	34	09:30	14:29	299	10.2	3,050	5.0	10.0	[illegible]
01/14/06	08	Background-Ground Floor East Side	34	11:00	16:30	330	10.2	3,366	17.0	17.0	[illegible]
01/14/06	09	Background-Ground Floor South Side	35	11:03	16:26	323	10.0	3,230	31.0	31.0	[illegible]
01/14/06	10	Outside Lobby Doors	31	11:34	16:25	291	10.1	2,939	10.5	10.5	[illegible]
01/15/06	11	6th Floor Work Area	35	10:15	11:00	45	10.0	450	3.0	10.0	[illegible]
01/16/06	12	Barrier Ck-6th Floor Stairwell	34	10:40	15:00	260	10.2	2,652	5.0	10.0	[illegible]
01/17/06	13	Background-7th Floor West Side	32	13:00	17:01	241	9.8	2,362	3.5	10.0	[illegible]
01/17/06	14	Background-7th Floor East Side	35	13:03	17:05	242	10.0	2,420	8.5	10.0	[illegible]
01/17/06	15	6th Floor Stairwell	34	13:10	17:10	240	10.2	2,448	23.0	23.0	[illegible]
01/19/06	16	Ground Floor Stairwell	35	08:45	12:50	245	10.0	2,450	10.0	10.0	[illegible]
01/20/06	17	Ground Floor Stairwell	35	08:20	12:30	250	10.0	2,500	5.0	10.0	[illegible]
01/20/06	18	Initial-6th Floor East Side	31	09:20	12:30	190	10.1	1,919	23.0	23.0	[illegible]
01/20/06	19	Initial-6th Floor South Side	19	09:25	12:32	187	10.0	2,010	37.5	37.5	[illegible]
01/20/06	20	Initial-6th Floor North Side	35	09:27	12:33	186	10.0	1,860	25.5	25.5	[illegible]
01/21/06	21	Retest	19	12:10	16:25	255	10.0	2,791	7.0	10.0	[illegible]
01/21/06	22	Retest	35	12:15	16:30	255	10.0	2,550	4.5	10.0	[illegible]
01/21/06	23	Retest	31	12:17	16:28	251	10.1	2,535	10.0	10.0	[illegible]
01/22/06	24	5th Floor Stairwell	34	11:00	14:35	215	10.2	2,193	5.5	10.0	[illegible]
01/22/06	25	4th Floor Background	35	11:10	14:48	218	10.0	2,180	8.5	10.0	[illegible]
01/23/06	26	6th Floor Stairwell	34	16:45	21:00	255	10.2	2,601	7.0	10.0	[illegible]
01/24/06	27	Initial-5th Floor	35	08:20	12:15	235	10.0	2,350	15.5	15.5	[illegible]
01/24/06	28	Initial-5th Floor	19	08:23	12:16	233	10.0	2,303	17.0	17.0	[illegible]
01/24/06	29	Initial-5th Floor	31	08:25	12:17	232	10.1	2,343	15.5	15.5	[illegible]
01/25/06	30	6th Floor Cleanup	35	08:30	12:15	225	10.0	2,250	7.0	10.0	[illegible]
01/25/06	31	6th Floor Cleanup	32	08:35	12:20	225	10.1	2,273	8.5	10.0	[illegible]
01/27/06	32	3rd Floor Outside Work Area	33	08:57	13:00	240	9.8	2,352	5.5	10.0	[illegible]
01/27/06	33	3rd Floor Outside Work Area	34	09:00	13:00	240	10.2	2,448	4.0	10.0	[illegible]
01/27/06	34	4th Floor Background (Att.)	32	11:21	14:47	206	10.1	2,081	5.0	10.0	[illegible]
01/28/06	35	3rd Floor Outside Work Area	34	08:39	12:39	240	10.2	2,448	3.0	10.0	[illegible]
01/28/06	36	3rd Floor Outside Work Area	32	08:37	12:37	240	10.1	2,424	23.0	23.0	[illegible]
01/28/06	37	3rd Floor Outside Work Area	34	11:42	14:42	180	10.2	1,836	10.0	10.0	[illegible]
01/28/06	38	3rd Floor Outside Work Area	32	13:44	16:45	181	10.1	1,828	13.5	13.5	[illegible]
01/29/06	39	3rd Floor Outside Work Area East	34	12:45	17:05	260	10.2	2,652	8.5	10.0	[illegible]
01/29/06	40	3rd Floor Stairwell West	32	12:50	17:00	250	10.1	2,644	12.0	12.0	[illegible]
01/30/06	41	3rd Floor Stairwell East	34	09:50	13:55	245	10.2	2,499	Too Dirty to Read		
01/30/06	42	2nd Floor Change Area	19	14:00	15:55	115	10.0	1,234	3.5	10.0	[illegible]
01/30/06	43	3rd Floor Stairwell West	32	10:00	13:59	239	10.1	2,414	8.5	10.0	[illegible]
01/31/06	44	Initial 3rd Floor	31	09:20	13:20	240	10.1	2,304	13.0	13.0	[illegible]
01/31/06	45	Initial 3rd Floor	34	09:20	13:30	245	10.0	2,450	14.8	14.8	[illegible]

BCM CONVERSE INC.
AIR MONITORING DATA REPORT

		Description	Pump No.	Sampling Per. Start	Sampling Per. Stop	Sample Time Min.	Cal. Flow Rate	Sample Vol. Liters	Fibers Counted	Minimum Fiber Count	Results Fibers/cc
02/16/86	95	1st Floor Final	19	19:19	21:39	939	10.0	9,719	9.5	10.0	0.003
02/16/86	96	1st Floor Final	31	19:21	21:35	934	10.1	9,303	6.0	10.0	0.003
02/16/86	97	Lobby Final	32	19:27	21:38	931	10.1	9,353	3.0	10.0	0.004
02/16/86	98	Lobby Final	34	19:34	21:40	926	10.2	9,395	8.5	10.0	0.004
02/16/86	99	Lobby Final	35	19:30	21:42	929	10.0	9,290	7.0	10.0	0.004
02/26/86	100	9th Floor Barrier	16	12:25	16:25	240	9.9	2,376	27.0	27.0	0.010
02/26/86	101	9th Floor Barrier	20	12:25	16:25	240	9.9	2,376	26.5	26.5	0.010
02/26/86	102	9th Floor Barrier	16	16:26	20:26	240	9.9	2,376	16.5	16.5	0.011
02/26/86	103	9th Floor Barrier	20	16:26	20:26	240	9.9	2,376	20.5	20.5	0.014
02/26/86	104	9th Floor at Decon Unit	23	17:55	20:26	151	8.9	1,344	9.5	10.0	[illegible]
02/27/86	105	9th Floor Barrier	16	08:15	13:22	307	9.9	3,039	20.5	20.5	[illegible]
02/27/86	106	9th Floor Barrier	20	08:15	13:22	307	9.9	3,039	16.5	16.5	0.006
02/27/86	107	9th Floor at Decon Unit	23	08:15	13:22	307	8.9	2,732	10.0	10.0	0.010
02/27/86	108	9th Floor Outside Work Area	0	09:27	13:22	235	8.5	1,998	10.0	10.0	0.008
02/27/86	109	9th Floor Barrier	16	13:30	19:50	380	9.4	3,572	29.0	29.0	0.010
02/27/86	110	9th Floor Barrier	20	13:30	19:50	380	9.4	3,572	17.0	17.0	0.007
02/27/86	111	9th Floor at Decon Unit	23	13:30	19:50	380	8.9	3,382	10.5	10.5	0.006
02/27/86	112	9th Floor Outside Work Area	0	13:30	19:50	380	8.5	3,230	26.5	26.5	0.013
02/28/86	113	9th Floor Barrier	16	VOID							
02/28/86	114	9th Floor Barrier	20	08:15	14:00	345	9.4	3,243	19.5	19.5	0.009
02/28/86	115	9th Floor Barrier	16	10:15	14:00	225	9.4	2,115	20.0	20.0	0.011
02/28/86	116	9th Floor Barrier	16	19:05	23:00	235	9.4	2,209	13.0	13.0	0.009
02/28/86	117	9th Floor Barrier	20	19:05	23:00	235	9.4	2,209	11.0	11.0	0.008
02/28/86	118	9th Floor at Decon Unit	23	19:05	23:00	235	8.9	2,092	10.0	10.0	0.007
03/01/86	119	9th Floor Final Clearance	16	19:58	06:35	637	9.4	5,988	20.0	20.0	0.005
03/01/86	120	9th Floor Final Clearance	20	20:00	06:37	637	9.4	5,988	19.5	19.5	0.005
03/01/86	121	9th Floor Final Clearance Mechanical Rm	23	19:59	06:36	637	8.9	5,669	12.0	12.0	0.003

REVIEWED BY: WT Dunn DATE: 3/23/86

ANALYZED BY: PED

PIS 00049093